



Functional outcome After Rectal and Anorectal Cancer Surgeries

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Abstract

Background: Surgical resection of cancer ano-rectum and rectum may have several functional disorders because of the anatomical relation between the rectum and pelvic nerve and urinary bladder. The major part of the rectum responsible for continence is the anorectal ring. The gold standard treatment for localized distal sigmoid cancer and/or rectal is total mesorectal excision (TME) with anterior resection (LAR). However, frequent bowel movement, urgency, fecal incontinence and emptying difficulties are frequently happened after low anterior resection (LAR) with anastomosis.

Aim of the study: The aim of this study is to declare the incidence of functional disorder after rectal and anorectal cancer resections.

Methodology: This study is a partially retrospective and prospective cohort study and was conducted at surgical oncology department of South Egypt Cancer Institute, Assiut University in the time period between January 2016 and December 2019. Patients with cancer rectum and cancer anorectum patients underwent surgery were included in the study (227 patients).

Results: This study included 227 patients, 127(55.9%) males and 100(44.1%) females table (1), giving female to male ratio 1:1.27. The patients' ages range between (18 and 86 years) with median age of 52 years. Most of our cases underwent ARD (64%), with about 13% underwent Low ARD, while about 9.5% underwent intersphincteric ULAR and 11% underwent APR and only 6 patients underwent PPE. **Conclusion:** Postoperative functional complications are very common following pelvic surgery. Long-term complications such as bladder dysfunction, sexual dysfunction, and low anterior rectal syndrome are common, but often overlooked when discussing postoperative complications in the literature and often neglected to be discussed with patients in the preoperative setting.

Keywords: rectal cancer, faecal dysfunction, urinary dysfunction, sexual dysfunction.

Introduction:

Colorectal cancer in Egypt has no age predilection and more than one-third of tumors affects a young population.[1] The high prevalence in young people can neither be explained on a hereditary basis nor can it be attributed to bilharziasis. The disease usually presents at an advanced stage, and predisposing adenomas are rare. Similarity of the data from different centers suggests that this is the picture of colorectal cancer typical of Egypt. [2]

It is the third most common malignancy and the fourth leading cause of cancer-related deaths worldwide, accounting for approximately 1,400,000 new cases and about 700,000 deaths worldwide [3]. In recent decades there has been a significant increase in the incidence; in particular, the number of newly diagnosed cases has increased from 783,000 in 1990 to 1,361,000 in 2012 [3]

Surgical resection of cancer ano-rectum and rectum may have several functional disorders because of the anatomical relation between the rectum and pelvic nerve urinary bladder. [1] The major part of the rectum

responsible for continence is the anorectal ring. The gold standard treatment for localized distal sigmoid cancer and/or rectal is total mesorectal excision (TME) with anterior resection (LAR). However, frequent bowel movement, urgency, fecal incontinence and emptying difficulties are frequently happened after low anterior resection (LAR) with anastomosis. This group of symptoms is termed Low Anterior Resection Syndrome. Colorectal surgeons did not completely understand which bowel dysfunctions is the matter of the patient and to what degree it affects his quality of life [4]

Rectum has a close proximity with pelvic nerve plexus and urogenital organs and related nerves [5]. Thus, Surgery for rectal cancer may damage the parasympathetic and sympathetic nerves of this area. As a result, many urinary dysfunctions may be happened like stress incontinence or emergency incontinence and this may cause serious problems [6]. Another important problem which may be happened following rectal surgeries is the sexual dysfunction which may have various symptoms in males and female as a result of the

damaged autonomous nervous plexus in the pelvic region. Duran et al revealed 20–60 % ejaculatory problems and 20–46 % impotence among men. [7]

Aim of the study:

The aim of this study is to declare the incidence of functional disorder after rectal and anorectal cancer resections.

Patients and Methods:

This study is a partially retrospective and prospective cohort study and was conducted at surgical oncology department of South Egypt Cancer Institute, Assiut University in the time period between January 2016 and December 2019. The prospective part of the study was from January 2019 to December 2019 including 21 cases.

All patients with cancer rectum and cancer anorectum patients underwent surgery were included in the study (227 patients) while patients with neurologic disorders affecting function of the urinary bladder and remaining part of the rectum causing urinary or fecal incontinence (e.g. Multiple sclerosis) and patients with preoperative functional disorders and patients with incomplete data were excluded from the study. Patients who had a temporary colostomy or ileostomy could participate if their stoma was closed.

All of the operations were performed by surgeons who are experts in colorectal surgery. TME was performed according to the principles described by Heald et al. and the pelvic autonomic nerves, including the hypogastric nerve and pelvic splanchnic plexus preserved as much as possible in all patients. In the cases of high anterior resection, a mesorectal transection was performed 5 cm from the tumor, and in low anterior resection and abdominoperineal resection the mesorectum totally removed. [8]

Data collection done from patient files, post-operative follow-up charts and documents –including demographic, clinical, histopathologic, surgical procedures and postoperative outcomes after taking informed consent from each case. Informed consent taken from cases done by contacting them and follow up their outpatient clinic visits.

Measures:

Clinical data included gender, site of the tumor, comorbidities, neoadjuvant therapy, type of surgery, Handsewn vs stapler technique, type of anastomosis either primary or primary with ileostomy and post-operative complications either local related to the wound or general related to the general health.

The LARS score, an internationally validated tool, was used to assess bowel dysfunction [9]. It consists of five questions with a score that ranges from 0 to 42 points, with classification of patients into: no LARS (0–20 points), minor LARS (21–29 points) or major LARS (30–42 points). International prostate symptom score (I-PSS) [10] that designed specifically to assess urinary dysfunction in which mild symptoms scores less than or equal to 7, moderate symptoms score range from 8 to 19

and severe symptoms range from 20 to 35. and separate items addressing sexual function for men and women [11]. International index of erectile function score (IIEF) for men [12] and The Female Sexual Function Index score (FSFI) for females [13]. For both questionnaires, a high functional score represents a high level of function while a high symptom score represents a high level of symptoms.

Statistical analysis:

All analyses were performed using the IBM SPSS Statistics ver. 24.0 (IBM Co., USA). Comparisons of patient and treatment characteristics between tumor location groups (rectum, anorectum) were performed using the chi-square test or Fisher's exact test for categorical data. The prevalence of the different groups was determined using descriptive analyses.

Sample size was calculated to show that with a power of 80% and significance of 0.05 level, the minimal sample size is estimated to be a total of 90 patients and our study included 227 cases.

Results:

This study included 227 patients, 127 (55.9%) males and 100 (44.1%) females, giving female to male ratio 1:1.27. The patients' ages **range** between (18 and 86 years) with **median age** of 52 years. Most cases were located in the rectum (82.9%) while only (18.1%) of cases had anorectal lesion. Preoperative radiotherapy was indicated for tumors of clinical T3 or T4 tumors and for cases with MRI/CT pelvis showing suspicious perirectal lymph nodes. The 'long course' radiotherapy concurrent with either (5-fluorouracil (5-FU) = 225mg/m² and leucovorin (LV) = 20mg/m²) or recently Xeloda (oral Capecitabine= 1250mg/m² twice daily) was used in our institute. This included 1.8-Gy/fraction technique irradiation for a total dose of either (45Gy/25 fractions) in 80% of cases or (50.4 Gy/28 fractions) in 20% of cases. Surgery was typically carried out 6-8 weeks after treatment completion of neoadjuvant chemoradiation. About one fourth of cases received neoadjuvant therapy (24.2%) patients had received chemoradiation while 13 (5.7%) patients had received chemotherapy only). Most of our cases underwent ARD (64%), with about 13% underwent Low ARD, while about 9.5% underwent intersphinctric ULAR and 11% underwent APR and only 6(2.6%) patients underwent PPE. About 50% of our cases underwent anastomosis using Handsewn technique and in 37.4% of patients the anastomosis was done using stapler.

About 50 % of our cases underwent anastomosis with covering ileostomy

The following was the major indications for placement of defunctioning ileostomy:

1. Ultralow anterior resection with anastomosis below peritoneal reflection especially in the setting of neoadjuvant chemoradiation therapy
2. Obstructing rectal cancer with proximal bowel dilatation and tissue edema
3. Intraoperative hemodynamic instability

Typically closure of this temporary stoma –in most cases- was conducted after ending of adjuvant therapy for the patient. Most of our patients had no post-operative complications but local complications were presented in 40(17.6%) cases including leak 15 patients, wound infection 20 patients, burst abdomen 15 patients, rectovaginal fistula 3 patients and prolapse of stoma 10 patients. Systemic complications include chest infection 5 patients, DVT 3 patients and pulmonary embolism in 1 patient. Patient may have more than one post-operative complication. Most of our cases suffer from minor faecal disorders (40%). Six percent of cases have major disorders. Patients recorded to have no complications include those with uneventful post-operative course as well as those who underwent APR (25 cases). About 26% of patients had minor urinary complications while about 6.5 % had moderate complications. Most of our cases didn't suffer from sexual complications but mild complications were presented in 40 (17.6%) patients and moderate in 16 (7.0%). (**Table 1**)

In table 2 more females (40%) significantly experienced urinary disorders than males (26%) ($p=0.011$). Anorectal tumors patients experienced more urinary complications (about 41.5%) than Rectal tumors Patients (about 30%) but there was no significant statistical difference ($p=0.1$). Presence of DM was associated with the greatest incidence of urinary complications (57% of cases) especially in moderate dysfunction ($p=0.014$). Patients who received neoadjuvant chemoradiation experienced more urinary complications in our study (about 44.5%) with tendency toward statistical significance ($p=0.07$). Patients who underwent PPE (100%) and APR (72%) were more likely to develop urinary disorders as compared to those who underwent ARD (about 20%), LARD (40%) and ULAR (38%) with high statistical difference ($p=0.000$) (table 2). Urinary complications include nocturia, urinary frequency and urgency, incomplete bladder emptying, week stream, intermittency and hesitancy/strain and the difference between minor and moderate to severe symptoms depending on the scoring of International prostate symptom score (I-PSS)

In table 3 there was a tendency to higher incidence of defaecatory disorders in females (47%) than males (45%) but without significant statistical difference ($p=0.095$). The rectal cancer patients experience significant high faecal complications in our study (49%) than anorectal patients (43%) ($p=0.002$) may be due to most of cases with anorectal tumors underwent APR. No significant association could be detected between preoperative medical comorbidities and defaecatory disorders ($p=0.655$). There was a tendency to higher incidence of defaecatory disorders in those received neoadjuvant chemoradiation (57%) especially in minor dysfunction than those who did not (50%). Faecal disorders related to Low ARD (93%) and ULAR (95%) were more than that for ARD (44%) with high significant statistical difference ($p=0.000$) may be due to more liability for anorectal ring affection. (table 3)

Table (1): Types and subtypes of variables and its distribution.

| Types and subtypes of variables | Number | Percentage % |
|---|--------|--------------|
| Age Distribution | | |
| - < or = 45 | 99 | 43.6 |
| - >45 | 128 | 56.4 |
| Sex distribution | | |
| - Male | 127 | 55.9 |
| - Female | 100 | 44.1 |
| Site of the tumor | | |
| - Rectum | 186 | 81.9 |
| - Anorectum | 41 | 18.1 |
| Comorbidities* | | |
| - No | 146 | 64.3 |
| - Cardiac | 42 | 18.5 |
| - HTN | 46 | 20.2 |
| - FM | 6 | 2.6 |
| Body Mass Index (BMI) | | |
| - < or = 30 | 95 | 41.9 |
| - > 30 | 132 | 58.1 |
| Neoadjuvant therapy | | |
| - No | 159 | 70.0 |
| - Chemoradiation | 55 | 24.2 |
| - Chemotherapy | 13 | 5.7 |
| Type of Surgery | | |
| - ARD | 145 | 63.9 |
| - Low ARD | 30 | 13.2 |
| - ULAR | 21 | 9.25 |
| - APR | 25 | 11.0 |
| - PPE | 6 | 2.6 |
| Handsewn vs Stapler technique of anastomosis* | | |
| - Handsewn | 113 | 49.8 |
| - Stapler | 85 | 37.4 |
| Type of anastomosis | | |
| - Iry anastomosis | 83 | 36.5 |
| - Iry anastomosis & ileostomy | 115 | 50.7 |
| Post-operative complications | | |
| - No | 180 | 79.3 |
| - Local | 40 | 17.6 |
| - Systemic | 7 | 3 |
| Defaecatory dysfunction | | |
| - No | 93 | 40.9 |
| - Minor | 91 | 40.1 |
| - Major | 14 | 6.2 |
| Urinary dysfunctions | | |
| - No | 154 | 67.8 |
| - Minor | 59 | 26.0 |
| - Moderate | 14 | 6.2 |
| Sexual dysfunction | | |
| - No | 171 | 75.3 |
| - Mild | 40 | 17.6 |
| - Moderate | 16 | 7.0 |
| Adjuvant therapy | | |
| - No | 8 | 3.5 |
| - Yes | 219 | 96.5 |

In table 4 there was no statistical difference in sexual disorders between males (25%) and females (24%) ($p=0.433$). The anorectal tumors patients experienced more sexual complications (31%) than those with rectal tumors patients (22%) but without significant difference ($p=0.5$). Surprisingly patients with no pre-operative medical comorbidities experienced more sexual disorders in the post-operative period (33%) ($p=0.015$). There was a tendency to higher incidence of sexual disorders in patients received neoadjuvant chemoradiation (29%) than those who didn't receive it (about 24%) but without significant statistical difference ($p=0.4$). Patients underwent ARD were less likely to have sexual disorders (11%) as compared to those who underwent LARD (56.7%), ULAR (52.6%), APR (48%) and PPE (33.3%) with significant difference ($p=0.000$). (table 4)

By analysis of multivariate test, we found that urinary disorders had significant correlations with age, gender and type of operation ($P=0.029$, 0.015 and 0.000 respectively). But on the other hand, defaecatory disorders showed significant relations with age, site of the tumor, type of operation, technique and anastomosis ($P=0.000$, 0.005 , 0.000 , 0.002 and 0.000 respectively) with tendency to significance with gender ($P=0.084$). While sexual dysfunction was significantly related to age and type of operation ($P=0.028$ and 0.043 respectively) with tendency toward high significance with postoperative complications ($P=0.051$) and anastomosis ($P=0.068$) the last two variables may related to each other as anastomosis with covering ileostomy reduce for significant percent postoperative complications. From all the previous tests and analysis age and type of surgery were the most important factors affecting urinary, defaecatory and sexual outcomes after rectal and anorectal tumor radical surgeries in addition to other factors. (table 5)

Discussion:

For many years, complications, survival, clinical health status, biochemical measures and functional results were the only measures for patient outcomes after cancer surgery. But in the last decades, quality of life became the field of interest for many researchers and considered as a key measurement in many clinical trials for cancer surgery outcomes. [14]

There is a significant relationship between gender and urinary complications in our study, 30 male patients developed minor complications while moderate urinary complications more common in females representing 11 female patients. The study of Matti et al [15] reported that poor flow more common in males. However, they reported that there was no significant difference between males and female in other urinary complications. Varpe et al also reported that gender had no significant impact on urinary incontinence [16].

Urinary complication were more observed in patients with comorbidities (P value= 0.01) and that was in keeping with the study of Kenichiro et al who reported that patients with comorbidities like diabetes and other risk factor such as tumor site in lower rectum,

size $> 4\text{cm}$ & operation time >240 min must be informed about possibility of urinary dysfunction postoperatively [17].

In the present study, we noted significant correlation between type of surgery and presence or absence of postoperative complications. 26 patients (17.9%) who underwent ARD developed minor urinary complication. Moderate urinary complications were common with APR and it represented by 5 patients (20%).

Benoist et al showed that the vast majority of patients undergoing upper and middle rectal resections (ARD) had a lower rate of urinary tract infections and a slightly higher incidence of acute urinary retention [18]. Yong et al reported in their study that patients undergoing rectal cancer surgery have a high risk of postoperative urinary retention especially those undergoing APR.

Urinary complications are more common in females and APR in our study may be because females has a weak pelvic floor due to multiple deliveries and in advanced cases dissection is more difficult and tedious that may lead to weakening of pelvic floor muscles and nerves but overall There are no data in our study that can explain these differences with regard to tumor stage or surgical technique as this was fairly similar.

Regarding neoadjuvant treatment, out of 48 patients received neoadjuvant chemoradiation, 27 patients experienced minor fecal complications. That was similar to the study of Stephens et al who stated that preoperative radiotherapy increased overall levels of fecal incontinence [19]. Also, Marijnen et al found that patients receiving neoadjuvant radiotherapy had slower recovery from defecation problems [20].

In our study, 79.3% ($n=23$) of patients underwent LAR developed minor fecal complications and 76.2% ($n=16$) of patients underwent ULAR also developed minor complications while 39.7% ($n=52$) of patients underwent ARD developed minor complication. That was in accordance with the study of Ekkarat et al who reported LARS occurred not only in rectal cancer cases who underwent low anterior resection, but also in patients underwent anterior resection of Dexon but with lower frequency [21].

Out of 40 patients with mild sexual complications, 25 patients were male and 15 patients were female. Regarding moderate complications, females (9 patients) were more common than males (7 patients). This was in accordance with the study done by Hendren et al who found that 29% of women and 45% of men have developed some degree of sexual dysfunction. [18]

Male sexual function is controlled by a combination of parasympathetic and sympathetic innervations from lumbar and sacral plexus. At any point of rectal surgery these innervations can be injured and this leads to sexual affection in the form of impotence and retrograde ejaculation. Parasympathetic damage may result in erectile dysfunction while sympathetic injury can result in retrograde ejaculation [22].

Table (2): Correlation between urinary disorders and factors affecting it

| Types and subtypes of variables | | No | Minor | Moderate | P-Value |
|---------------------------------|----------------|-------------|------------|------------|---------|
| Age | < or = 45 | 76(76.8%) | 19(19.2%) | 4(4%) | 0.039 |
| | > 45 | 78(60.9%) | 40(31.2%) | 10(7.8%) | |
| Gender | Male | 94 (74.0%) | 30 (23.6%) | 3 (2.4%) | 0.011 |
| | Female | 60 (60.0%) | 29 (29.0%) | 11 (11.0%) | |
| Site | Rectum | 130(69.9%) | 45 (24.2%) | 11 (5.9%) | 0.1 |
| | Anorectum | 24 (58.5%) | 14 (34.1%) | 3 (7.3%) | |
| Comorbidities | No | 110 (75.3%) | 29 (19.9%) | 7 (4.8%) | 0.014 |
| | Cardiac | 14 (48.3%) | 13 (44.8%) | 2 (6.9%) | |
| | HTN | 22 (66.7%) | 9 (27.3%) | 2 (6.1%) | |
| | DM | 8 (42.1%) | 8 (42.1%) | 3 (15.8%) | |
| BMI | < or = 30 | 62(65.3%) | 28(29.5%) | 5(5.3%) | 0.566 |
| | > 30 | 92(69.7%) | 31(23.5%) | 9(6.8%) | |
| Neoadjuvant | No | 117(73.6%) | 35 (22.0%) | 7 (4.4%) | 0.07 |
| | Chemoradiation | 30 (54.5%) | 19 (34.5%) | 6 (10.9%) | |
| | Chemotherapy | 7 (53.8%) | 5 (38.5%) | 1 (7.7%) | |
| Type of Surgery | ARD | 116 (80.0%) | 26 (17.9%) | 3 (2.1%) | 0.000 |
| | Low ARD | 18 (60.0%) | 10 (33.3%) | 2 (6.7%) | |
| | ULAR | 13 (61.9%) | 7 (33.3%) | 1 (4.8%) | |
| | APR | 7 (28.0%) | 13 (52.0%) | 5 (20.0%) | |
| | PPE | 0 (0.0%) | 3 (50.0%) | 3 (50.0%) | |

Table (3): Correlation between defaecatory disorders and factors affecting it

| Types and subtypes of variables | | No | Minor | Major | P-Value |
|---------------------------------|----------------|------------|------------|------------|---------|
| Age | < or = 45 | 53(53.5%) | 41(41.4%) | 5(5.1%) | 0.805 |
| | > 45 | 69(53.9%) | 50(39.1%) | 9(7.0%) | |
| Gender | Male | 69 (54.3%) | 54 (42.5%) | 4 (3.1%) | 0.095 |
| | Female | 53 (53.0%) | 37 (37.0%) | 10 (10.0%) | |
| Site | Rectum | 99 (53.2%) | 78 (41.9%) | 9 (4.8%) | 0.002 |
| | Anorectum | 23 (56%) | 13 (31.7%) | 5 (12.1%) | |
| Comorbidities | No | 61 (48.8%) | 56 (44.8%) | 8 (6.4%) | 0.655 |
| | Cardiac | 12 (42.9%) | 14 (50%) | 2 (7.1%) | |
| | HTN | 14 (46.7%) | 12 (40%) | 4 (13.3%) | |
| | DM | 6 (40%) | 9 (60%) | 0 (0%) | |
| BMI | < or = 30 | 48(50.5%) | 40(42.1%) | 7(7.4%) | 0.650 |
| | > 30 | 74(56.1%) | 51(38.6%) | 7(5.3%) | |
| Neoadjuvant | No | 69 (50%) | 61 (44.2%) | 8 (5.8%) | 0.052 |
| | Chemoradiation | 18 (37.5%) | 27 (56.2%) | 3 (6.2%) | |
| | Chemotherapy | 6 (50%) | 3 (25%) | 3 (25%) | |
| Type of Surgery | ARD | 74 (56.5%) | 52 (39.7%) | 5 (3.8%) | 0.000 |
| | Low ARD | 2 (6.9%) | 23 (79.3%) | 4 (13.8%) | |
| | ULAR | 1 (4.8%) | 16 (76.2%) | 4 (19%) | |
| | APR | 14 (100%) | 0 (0%) | 0 (0%) | |
| | PPE | 2 (60.7%) | 0 (0%) | 1 (33.3%) | |

Table (4): Correlation between sexual disorders and factors affecting it

| Types and subtypes of variables | | No | Mild | Moderate | P-Value |
|---------------------------------|----------------|-------------|------------|-----------|---------|
| Age | < or = 45 | 62(62.6%) | 28(28.3%) | 9(9.1%) | 0.000 |
| | > 45 | 109(85.2%) | 12(9.4%) | 7(5.5%) | |
| Gender | Male | 95 (74.8%) | 25 (19.7%) | 7 (5.5%) | 0.433 |
| | Female | 76 (76.0%) | 15 (15.0%) | 9 (9.0%) | |
| Site | Rectum | 143 (76.9%) | 31 (16.7%) | 12 (6.5%) | 0.5 |
| | Anorectum | 28 (68.3%) | 9 (22%) | 4 (9.8%) | |
| Comorbidities | No | 99 (67.8%) | 34 (23.3%) | 13 (8.9%) | 0.015 |
| | Cardiac | 24 (82.8%) | 3 (10.3%) | 2 (6.9%) | |
| | HTN | 32 (97%) | 0 (0%) | 3 (3%) | |
| | DM | 16 (84.2%) | 3 (15.8%) | 0 (0%) | |
| BMI | < or = 30 | 77(81.1%) | 14(14.7) | 4(4.2%) | 0.187 |
| | > 30 | 94(71.2%) | 26(19.7) | 12(9.1%) | |
| Neoadjuvant | No | 120 (75.5%) | 29 (18.2%) | 10 (6.3%) | 0.4 |
| | Chemoradiation | 39 (70.9%) | 11 (20%) | 5 (9.1%) | |
| | Chemotherapy | 12 (92.3%) | 0 (0.0%) | 1 (7.7%) | |
| Type of Surgery | ARD | 130 (89.7%) | 13 (9.0%) | 2 (1.4%) | 0.000 |
| | Low ARD | 13 (43.3%) | 15 (50.0%) | 2 (6.7%) | |
| | ULAR | 9 (47.4%) | 8 (42.1%) | 2 (10.5%) | |
| | APR | 13 (52.0%) | 4 (16.0%) | 8 (32.0%) | |
| | PPE | 4 (66.7%) | 0 (0.0%) | 2 (33.3%) | |

Table (5): Multivariate analysis

| Variables | Dysfunction | Sig. |
|------------------------------|-------------|-------|
| Age | Urinary | 0.029 |
| | Faecal | 0.000 |
| | Sexual | 0.028 |
| Gender | Urinary | 0.015 |
| | Faecal | 0.084 |
| | Sexual | 0.849 |
| Site | Urinary | 0.293 |
| | Faecal | 0.005 |
| | Sexual | 0.748 |
| Comorbidities | Urinary | 0.108 |
| | Faecal | 0.955 |
| | Sexual | 0.410 |
| BMI | Urinary | 0.722 |
| | Faecal | 0.236 |
| | Sexual | 0.124 |
| Neoadjuvant | Urinary | 0.396 |
| | Faecal | 0.923 |
| | Sexual | 0.696 |
| Operation | Urinary | 0.000 |
| | Faecal | 0.000 |
| | Sexual | 0.043 |
| Operative complications | Urinary | 0.737 |
| | Faecal | 0.471 |
| | Sexual | 0.051 |
| technique | Urinary | 0.494 |
| | Faecal | 0.002 |
| | Sexual | 0.352 |
| Anastomosis | Urinary | 0.404 |
| | Faecal | 0.000 |
| | Sexual | 0.068 |
| Post-operative complications | Urinary | 0.527 |
| | Faecal | 0.964 |
| | Sexual | 0.633 |
| Adjuvant | Urinary | 0.829 |
| | Faecal | 0.607 |
| | Sexual | 0.934 |

Alterations in satisfaction, arousal and sexual desire are types of female sexual dysfunction. In addition, female can develop infertility because of mechanical dysfunction affecting fallopian tubes and ovaries and this is considered the hard evidence of dysfunction[23]. Bregendahl et al found that in females who underwent either an APR or LAR for rectal cancer, 72% suffered from vaginal dryness, 53% with dyspareunia, 29% with

reduced vaginal dimensions, and 69% had little to no sexual desire postoperatively[24].

In the present study mild and moderate sexual complications were more common seen in upper and middle rectal surgery than lower rectal and anal canal surgery (43 patients) while Adam et al reported that lower rectal surgeries were more associated with worse sexual dysfunction postoperatively [25] this is because of different patient numbers.

In the present study, it was noticed significant relationship between presence of comorbidities and development of sexual complications. 99 patients who didn't have any comorbidities, didn't develop any sexual complications. This was in keeping with the study of Costa et al who found that there was strong correlation between comorbidities especially type 2 DM and development of erectile dysfunctions [26]

In the present study, out of 30 patients who underwent Low ARD, 15 patients (50%) developed mild sexual complications and out of 25 patients who underwent APR, only 8 patients (32%) developed moderate sexual complications. The study of Hendren et al stated that type of surgical procedure affects significantly on sexual functions with worst complication with APR [27].

Out of 219 patients who received adjuvant therapy postoperatively, 36 patients (16.4%) and 16 patients (7.3%) developed mild and moderate sexual complications respectively (P value=0.045) which is statistically significant. However, Costa et al reported that no association between adjuvant therapy and sexual complications [26]. This could be explained by smaller number of patients of the study of Costa et al (n=43 patients) [26].

By analysis of multivariate test, we found that urinary disorders had significant correlations with age, gender and type of operation (P= 0.029, 0.015 and 0.000 respectively). But on the other hand, defaecatory disorders showed significant relations with age, site of the tumor, type of operation, technique and anastomosis (P=0.000, 0.005, 0.000, 0.002 and 0.000 respectively) with tendency to significance with gender (P=0.084). While sexual dysfunction was significantly related to age and type of operation (P=0.028 and 0.043 respectively) with tendency toward high significance with postoperative complications (P=0.051) and anastomosis (P=0.068) the last two variables may related to each other as anastomosis with covering ileostomy reduce for significant percent postoperative complications. From all the previous tests and analysis age and type of surgery were the most important factors affecting urinary, defaecatory and sexual outcomes after rectal and anorectal tumor radical surgeries in addition to other factors.

Conclusion:

Not all complications are preventable, a detailed understanding of the rates of these complications, as well as the treatment and prevention of them, is necessary to achieve a desirable outcome. Since not all complications have an established anatomic and

physiologic etiology, further research is needed in these three areas to better understand why, when, and how these complications arise.

These complications directly affect the patient's postoperative quality of life; therefore, maximum efforts should be made to treat them when they occur and prevent them when possible.

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List of abbreviations:

| | |
|------|---|
| EAS | External anal sphincter |
| CRM | Circumferential Resection Margin |
| GIST | Gastrointestinal mesenchymal and stromal tumors |
| DRE | Digital Rectal Examination |
| ERUS | Endorectal US |
| EAUS | Endoanal ultrasound |
| QOL | Quality of Life |
| IAS | Internal anal sphincter |
| ATZ | Anal transition zone |
| EAS | external anal sphincter |
| TME | Total Mesorectal Excision |
| LARS | Low Anterior Resection Syndrome |
| ANP | autonomic nerve preservation |
| IEF | International Index of Erectile Function |
| CRC | Colorectal Cancer |

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