EARLY POST-OPERATIVE PERINEAL WOUND COMPLICATIONS IN PATIENTS UNDERGOING EXTRA LEVATOR ABDOMINOPERINEAL EXCISION, A RETROSPECTIVE STUDY AT DEPARTMENT OF SURGICAL ONCOLOGY

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ABSTRACT

Objective: To emphasize on the early wound complications of the above-mentioned procedure.
Study Design: Retrospective observational study.
Place and Duration of Study: The study was conducted at department of Surgical Oncology, Shaukat Khanum Memorial Cancer Hospital & Research Center, from Jan 2014 to Dec 2019.
Methodology: A total of 84 patients were included in the study who underwent extra levator abdominoperineal excision. It was a retrospective study with convenient sampling. The data was retrieved from Hospital information system (HIS) that is a fully electrotonic system and is prospectively maintained. Variables were expressed as median and IQR was calculated. Univariate and multivariate analysis was performed. The *p*-value of ≤0.05 was considered significant.
Results: Wound infection was observed in 32 (38.09%) of the patients. Wound dehiscence was seen is 5 (5.95%) of the patients. Median day of detection of infection was day 10 (5-22). Median hospital stay was 7 (4-22) days. On multivariate analysis the correlation of Body mass index with perineal wound infection was statistically significant with *p*-value of 0.045.
Conclusion: Extra levator abdominoperineal excision is a procedure with significant perineal wound complication rate. The occurrence of perineal wound complications is multifactorial. Judicial use of the procedure is warranted.

Keywords: Abdominoperineal excision, Dehiscence, Distal rectal cancer, Extra levator, Extra levator abdominoperineal excision, Perineal wound.

INTRODUCTION

Extralevator Abdominoperineal Excision (ELAPE) is an emerging technique for the management of locally advanced distal rectal tumors in which sphincter preservation cannot be performed. The technique has not yet been adopted globally, however now as evidence is emerging more and more centers are adopting this technique. There is an ongoing debated whether ELAPE has oncological and survival benefits. Many studies have shown improved oncological outcomes and hence survival in patients undergoing ELAPE as compared to conventional abdominoperineal excision (CAPE) for the management of locally advanced distal rectal cancers[1].

Management of rectal cancers is complex as various factors like local disease burden, co morbidities, distance from anal verge and sphincter involvement influence the decision of operative strategy[2]. The preferred operation in the management of rectal cancers is anterior resection (AR) or low anterior resection (LAR) with preservation of the sphincter and colorectal anastomosis[3]. However, in certain circumstances the sphincters have to be sacrificed and abdominoperineal resection with end colostomy has to be carried out to obtain oncological clearance.

The overall prognosis of patients of distal rectal cancer is worse as compared to proximal rectal and rectosigmoid cancers[4], because the distal few cm of rectum is devoid of mesorectum and the nearby structures such as prostate in males and vagina in females anteriorly and the levator muscles laterally are closely present without any significant barriers to prevent local invasion. Thus, it is common for these cancers to prevent at an advanced stage. Likewise,

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Abdominoperineal Excision (APE) carries a poorer prognosis as compared to anterior resection (AR), which is mostly done for upper and mid rectal cancers that have a mesorectal envelope.

The concept of Total Mesorectal Excision (TME) has improved patient outcomes in the rectal cancer[5]. Since its introduction by Heald *et al* in 1982 it has revolutionized the management of rectal cancer. However, as the distal few cm of rectum are devoid of mesorectum the prognosis of distal rectal cancer remains poor.

Positive circumferential margins (CRM) and intra-operative tumor perforations are one of the major factors that lead to local disease relapse and overall poor patient outcomes[6]. To overcome the poor outcomes the concept of ELAPE was introduced by Holm *et al* in 2007[7]. ELAPE involves TME up to the coccyx posteriorly and Denonviller's fascia anteriorly. At this point further dissection southwards is stopped to prevent conning and wasting of the specimen. Further perineal part is being performed in prone Jack-Knife position. ELAPE leaves a pelvic defect that can be reconstructed with mesh or flaps or can be closed primarily[8].

ELAPE is also associated with more early and late wound complications. The Early perineal complications range from wound infection to dehiscence[9]. Various studies have stated that the wound complications are more pronounced in ELAPE as compared to CAPE due to more extensive dissection. Most of the cases that undergo ELAPE have already been previously radiated as part of neoadjuvant approach that further decreases the ability of the tissue to heal post-operatively[10]. Perineal wound infection has been reported in up to 44% of cases undergoing ELAPE. Infection and sepsis increase patient morbidity, duration of hospital stay, cost of treatment and delayed return to adjuvant treatment[9].

The rationale for doing this study is to focus on the perineal complications of patients undergoing ELAPE and its associations with various patient and disease related factors. Moreover, we intend to bring light to the fact that judicious use of this procedure shall be undertaken.

METHODOLOGY

This was a retrospective analysis of patients undergoing ELAPE at Department of Surgical Oncology, Shaukat Khanum Memorial Cancer Hospital & Research Center (SKMCH & RC) between 1st January 2014 and 31st December 2019 and all patients who underwent ELAPE during the said time were included. Approval was taken from the hospital Institutional Review Board (IRB) vide number EX-01-04-20-01. A total of 84 patients underwent ELAPE during the said period and all patients were included in the study. No patients who underwent ELAPE were excluded from the study. Informed consents were taken from the patients and confidentiality of the patients was maintained. The data was retrospectively retrieved from Hospital Information System (HIS) that is a fully electronic data system that is prospectively maintained. We retrieved the demographic, pathological, radiological and treatment data. Patient's follow-ups and examinations were retrospectively reviewed in the HIS.

After initial diagnostic and staging workup, all patients were being discussed in the Multi-Disciplinary Team (MDT) meeting of the hospital before their treatments were initiated. All patients that were being treated with ELAPE were locally advanced distal rectal tumors that were threatening the CRM or abutting the levators, thus majority of these patients underwent neo-adjuvant Chemoradiotherapy with 50.4 Gy and oral capecitabine. After neo-adjuvant treatment, patients were restaged with MRI Pelvis and CT scan Chest and Abdomen followed by clinical examination. Decision for surgery was then made. Patients were normally operated 6-8 weeks post neo-adjuvant treatment. Post-operatively the patients were daily screened for signs of infection at the perineal wound during their stay at the hospital, at the time of discharge and on the subsequent visits in the outpatient department. The subsequent visits in the outpatient department were scheduled on the 10th day post-

surgery and at 4th week post-surgery. However, more frequent visits were arranged if needed according to the clinical condition of the patient.

On each visit the patients were evaluated by a consultant surgeon.

Technique

Almost all patients underwent Laparoscopic abdominal part of the operation followed by perineal part performed in prone jack knife position (fig-1a). The abdominal dissection was completed till coccyx posteriorly and Denonvilliers's fascia anteriorly, further dissection was stopped to prevent specimen wasting and conning. Abdominal drain was placed, omentum brought in the pelvis and a 4 x 12cm rytec gauze was packed in the pelvis. Stoma matured in the left iliac fossa and patient moved to prone jack knife position for perineal part of the operation (fig-1a). Tear drop incision was made around the anus and first entry was made into the presacral fascia posteriorly, just anterior to the coccyx. The coccyx may or may not be removed at this point. Levator muscles were divided widely on the both sides. Specimen was flipped and anterior dissection

Table-I: Patient characteristics.

Patient Characteristics	
Age	
Median (range)	39 (18-70)
Gender n (%)	
Male	64 (76.2%)
Female	20 (23.8%)
Body Mass Index (BMI)	
Median (range)	23 (15 – 38)
American Society of Anesthesiologists (ASA) classification, n(%)	
I	77 (91.7%)
II	7 (8.3)
III	-
IV	-
Duration of symptoms (months)	
Median (range)	5 (1 – 24)
Distance from anal verge (cm)	
Median (range)	2 (0 - 6)
Carcinoembryonic antigen (CEA)	
Median (range)	4.05 (0.60 – 192.00)
Albumin (g/dl)	
Median (range)	4.23 (3.05 – 5.17)
Hemoglobin (g/dl)	
Median (range)	13.45 (6.80 – 17.80)
Clinical Staging TNM, n (%)	
T1	-
T2	3 (3.6%)
T3	65 (77.4%)
T4	15 (17.9%)
N0	11 (13.1%)
N1	35 (41.7%)
N2	37 (44.0%)
N3	1 (1.2%)
M0	81 (96.4%)
M1	3 (3.6%)
Neoadjuvant Chemoradiation	
Given	80 (95.2%)
Not Given	4 (4.8%)
Histopathology	
Adenocarcinoma	82 (97.61%)
Melanoma	2 (2.38%)

Table-II: Operative variables.

Operative Variables	
Mode of Surgery n (%)	
Laparoscopic	83 (98.8%)
Laparoscopic converted to open	1 (1.2%) -
Positioning in Perineal Part n (%)	
Supine	0 (0%)
Prone Jack Knife	84 (100%)
Operative time(minutes)	
Median (range)	320 (250 – 490)
Blood loss(ml)	
Median (range)	70 (25 – 600)
Reconstruction n (%)	
Mesh	17 (20.2%)
Flap	1 (1.2%)
Omentoplasty	66 (78.57%)
Drain n (%)	
Jaxon Pratt	4 (4.8%)
Redon	77 (91.70)
Corrugated drain	3 (3.60%)
Total Mesorectal Excision (TME) (complete)	
n (%)	78 (92.85%)
Intra-operative Tumor Perforation	
n (%)	5 (6%)
Extended Pelvic Resections	
Prostate capsule resection	5 (5.92%)
Partial vaginectomy	13 (15.5%)
Positive Circumferential Resection Margins (CRM)	
n (%)	17 (20.2%)

was completed under vision and a cylindrical specimen was delivered. During the anterior dissection posterior wall of vagina if involved was removed and defect closed. Likewise, the prostatic capsule in males was removed. We routinely used a silicone Foley's catheter that could be palpated at all times during anterior dissection to prevent urethral injury. Resection left a considerable perineal defect (fig-1b). The defect was either re-constructed with a mesh (fig-1c) or a flap reconstruction was used. Primary closure with Omentoplasty (fig-1d) was also be performed in some patients. Our early cases were reconstructed with Ultra-pro mesh. However, afterwards we gave up the practice of routine mesh placement and adopted Omentoplasty as the mode of closure. Flap reconstruction was used only selectively.

Table-IV: Pre and per-operative characteristics, univariate analysis and *p*-value.

Pre and Post-Operative Characteristics	*p*-value
Age in years	0.846
Gender	0.258
Location of tumor	0.191
ASA grade	0.458
BMI	0.002
Comorbids	0.243
Clinical T stage	0.909
Albumin	0.846
Hemoglobin	0.312
Operative time	1.00
Blood loss	0.093
Perforation	0.761
Mode of surgery	0.404
Vaginal resection	0.515
Type of drain used	0.614
Mode of defect repair	0.095
Type of mesh used	0.141

Table-V: Multivariate logistic regression model.

Variables Categories	Adjusted OR (CI), *p*-value
Body mass index	
Mean ± SD	1.10 (1.00 1.20), 0.045
Hemoglobin	
Mean ± SD	0.85 (0.71 1.02), 0.09
Resection Margins	
R0	Ref
R1	1.54 (0.60 4.10), 0.40
Albumin	
Mean ± SD	0.74 (0.26 2.11), 0.60
Operation time	
Mean ± SD	1.10 (1.00 1.03), 0.08

Early Post-operative Period

Early post-operative period was defined as 30 days post-surgery.

Perineal Wound Infection

Perineal wound infection was defined as presence of pus discharge, pain, erythema, tenderness, swelling or deep space infection in the perineal wound.

Table-III: Perineal wound complication data.

Perineal Wound Complication Data	
Perineal wound complicationn (%)	37 (44.04%)
Wound infection n (%)	32 (38.09%)
Dehiscence n (%)	5 (5.95%)
Post-operative Day Wound Infection Detected	
Median (range)	10 (5 – 22)
Culture growth n (%) of total infected	32 + 5 = 37
Positive	17 (45.94%)
Negative	20 (54.06%)
Intervention n (%)	32 (100 %)
Dressings and Antibiotics Only	22 (68.75%)
Surgical Debridement	6 (18.75 %)
Radiological Drain Placement	2 (6.25%)
Vacuum assisted closure (VAC)	1 (3.125 %)
Flap	1 (3.125%)
Perineal Hernia	1 (1.19%)
Hospital stay (days)	
median (range)	7 (4-22)
Time to return to adjuvant chemotherapy (if needed) Weeks:	
median (range)	5 (4-7)

Perineal Wound Dehiscence

Perineal wound dehiscence was defined as partial or complete separation of wound skin with or without infection.

Analysis

The data was analyzed using SPSS MAC version 26. Descriptive statistics were run and data was expressed as median along with inter quartile range (IQR). Multivariate analysis using

the regression model was done. Chi-square test was performed for categorical, Mann-Whitney U test for non-parametric and student t-test for parametric variables. The *p*-value of ≥0.05 was considered significant.

RESULTS

A total of 84 patients underwent ELAPE between January 2014 and December 2019. Various characteristics of the patients are being described in detail in table-I. Median age of the patients was 39 (18-70) years. The study population had a male pre dominance with 64 (76.2%) patients being males. The median BMI of the patients was 23 (15-38). The median duration of symptoms before presentation was 5 (1-24) months. The median distance from anal verge was 2 (0-6) cm. Most of the tumors were T3 and T4 according to American Joint Committee on Cancer (AJCC) TNM classification. Neoadjuvant chemoradiation was done in 80 (95.23%) of the patients.

In table-II the operative variables are being discussed. Amongst the studied cohort, 83 (98.8%) of the patients had laparoscopic resection of the abdominal part and all patients had perineal part performed in prone Jack Knife position. Mesorectum was complete in 78 (92.8%) of the cases. There were five intra-operative tumor perforations. Positive circumferential margins (CRM) was observed in 17 (20.2%) patients.

Table-III describes different variables in pertinence to wound infection. Wound infection was observed in 32 (38.09%) of the patients. 5 (5.95%) of the patients developed wound dehiscence. Median day of wound infection detection was day[10]. Of those requiring intervention majority were being managed by dressings and antibiotics only. However, six patients needed surgical drainage and debridement. Those managed by surgical debridement underwent secondary suturing. Radiological drain was placed in two, one patient needed gracilis flap and another patient was managed by Vacuum Assisted Closure (VAC). Median hospital stay was 7 (4-22) days. Staphylococcus species were the most freq-

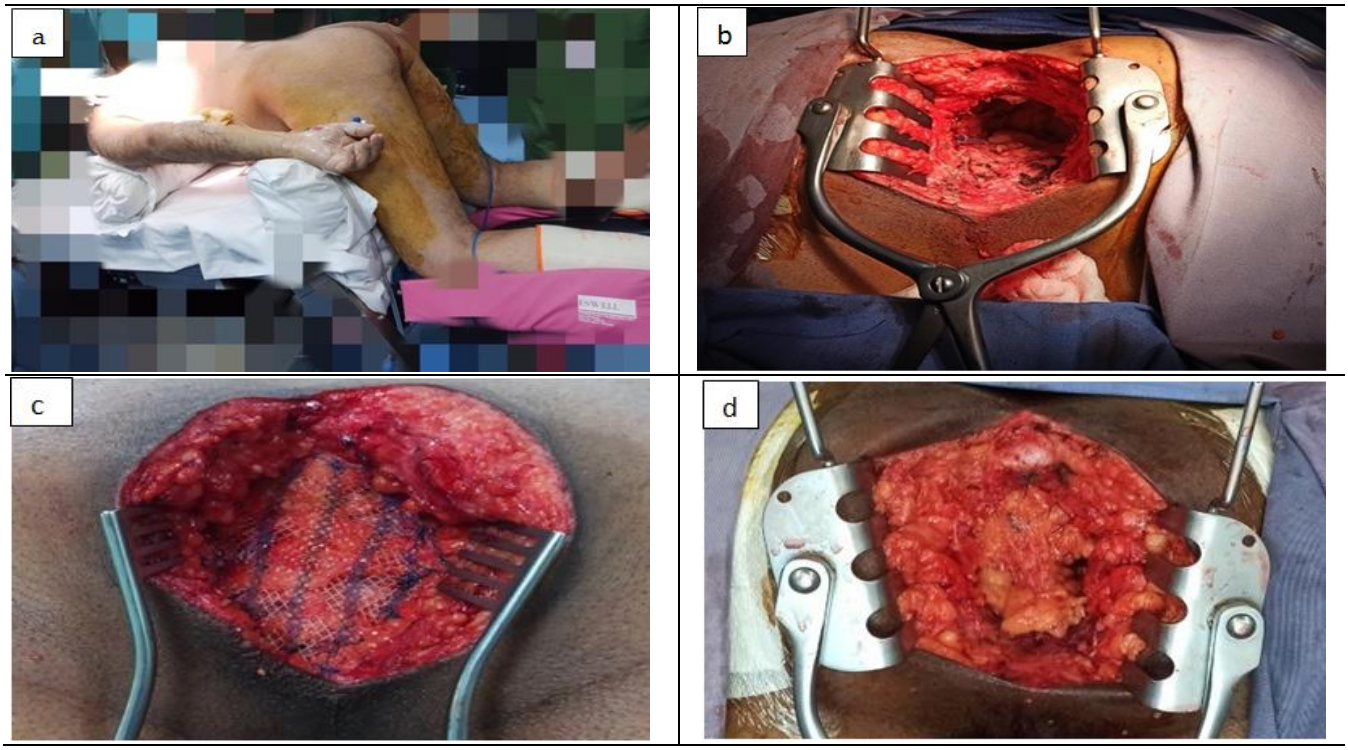

Figure: a) Prone Jack Knife position for perineal part of the operation, b) Perineal defect post resection of specimen, c) Mesh reconstruction of the defect, d) Omentoplasty of the perineal defect.

uently cultured organism followed by *streptococci* and *Escherichia Coli*.

Table-IV and e show the univariate analysis. On multivariate analysis (table-V) Body mass index (BMI) was identified as a significant independent risk factor for infection: BMI (mean ± standard deviation) (adjusted odds ratio [AOR] 1.10; 95% confidence interval [CI] (1.00 – 1.20), *p*-value (0.045). Hemoglobin (Hb) was marginally statistically significant in logistic regression model: Hb (mean ± standard deviation) adjusted odds ratio [AOR] 0.85; 95% confidence interval [CI] (0.71 – 1.02), *p*-value (0.09).

The correlation of resection margins, albumin and operative time were not statistically significant as independent factors for perineal wound infection. The correlation with intra operative perforations was clinically significant on our clinical observation however, the number of intraoperative perforations were only five. Thus, it was not feasible to run the regression model as the numbers were too low to calculate statistical significance.

DISCUSSION

Since its introduction ELAPE is believed to offer better oncological outcomes as a more radical resection can be performed and negative margins can be obtained[1]. However, the extensive resection in the presence of previously radiated perineum paves path for further complications.

As majority of the patients undergoing ELAPE are given neo-adjuvant chemoradiotherapy the healing capacity of radiated area is decreased[11]. The wide resection of the levators leave a big defect in the perineum (fig). Perineal wound complications after ELAPE have been reported in range of 20-46% of the patients under going ELAPE[12]. On literature review, three previously done studies by Pyrtz *et al*[13], Asplud *et al*[14], and Niharka *et al*[15] have also reported wound complication rates in range of 20-44%. The perineal wound complication rate of 44.04% in our reported series falls between the previously reported figures. The uniform use of neoadjuvant chemoradiation might have contributed to our reported higher wound infection rate. A nation wide study that was conducted at Denmark concluded that ELAPE and neo-adjuvant chemoradiotherapy were independent risk factors for the development of perineal complications[16].

Following resection there are various methods for dealing with the perineal defect. Either mesh or flaps can be used for the reconstruction. The perineal wound can be primarily closed as well. However, there are more chances of hernia formation if the defect is primarily closed[17].

In our series 66 (78.57%) were being primarily closed with aid of omentoplasty, the rest were being managed by either mesh or flap. In published data the incidence of perineal hernia has been reported in up to 2% of the patients[18]. However, many patients can have asymptomatic perineal hernia that can be detected on imaging. We plan to upraise this association in detail in a study later on.

The time of adjuvant chemotherapy can get adversely effected in cases of perineal wound complications. A recent study concluded that the average time from day of surgery to resumption of adjuvant chemotherapy was between 9 and 11 weeks. In our series the average time of resumption of adjuvant chemotherapy was 5 (4-7) weeks. Resumption of adjuvant chemotherapy in our studied cohort was early as compared to the published data. However, in cases where there was a delayed wound healing or wound complication the time to adjuvant chemotherapy was significantly delayed.

The circumferential resection margins were positive (R1) in 17 (22%) of the patients. The positivity was likely due to bad patient selection. More cases with positive circumferential margins were reported towards the end of the series. It is likely due to more experience with ELAPE and we started attempting more cases that were locally advanced to start with and R0 resection could not have been possible. However, it was attempted and the results were more R1 resections. This issue has been upraised at our depart-

ment and we have improved patient selection criteria now.

The median hospital stay following ELAPE at our institution was 7 (4-22) days. That was significantly less as compared to the published data[19]. Being a high-volume rectal cancer center and implementation of enhanced recovery programs, we have managed to improve patient outcomes and decrease hospital stay and costs of treatment.

LIMITATION OF STUDY

The limitations of the study include a small sample size and retrospective nature.

CONCLUSION

ELAPE is a procedure with significant perineal wound complication rate. Multiple factors contribute to the development of perineal complications. Patients for ELAPE shall be carefully selected and the recognized factors that are shown to cause perineal wound complication shall be corrected if possible. However, if these factors cannot be altered then these patients shall be carefully observed for development of perineal wound complications and prompt detection and intervention shall be done.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES

1. Winter DC. Extralevator abdominoperineal resection for low rectal cancer: new direction or miles behind?. Arch Surgery 2010; 145(9): 811-13.
2. Sun Z, Yu X, Wang H, Ma M, Zhao Z, Wang Q. Factors affecting sphincter-preserving resection treatment for patients with low rectal cancer. Exper Therapeutic Med 2015; 10(2): 484-90.
3. Paty PB, Enker WE, Cohen AM, Lauwers GY. Treatment of rectal cancer by low anterior resection with coloanal anastomosis. Ann Surg 1994; 219(4): 365.
4. Jung MK, Shin US, Ki YJ, Kim YB, Moon SM, Sung SJ. Is the location of the tumor another prognostic factor for patients with colon cancer? Ann Coloproctol 2017; 33(6): 210.
5. Delibegovic S. Introduction to total mesorectal excision. Medical Arch 2017; 71(6): 434.
6. Eriksen MT, Wibe A, Syse A, Haffner J, Wiig JN. Inadvertent perforation during rectal cancer resection in Norway. Br J Surg 2004; 91(2): 210-16.
7. Holm T, Ljung A, Häggmark T. Extended abdominoperineal resection with gluteus maximus flap reconstruction of the pelvic floor for rectal cancer. Br J Surg 2007; 94(2): 232-38.
8. Peirce C, Martin S. Management of the perineal defect after abdominoperineal excision. Clin Colon Rectal Surg 2016; 29(2): 160.
9. Wiatrek RL, Thomas JS, Papaconstantinou HT. Perineal wound complications after abdominoperineal resection. Clin Colon Rectal Surg 2008; 21(1): 76.
10. Hoare D, Maw A, Gollins S. Does pre-operative chemoradiotherapy cause wound complications after abdominoperineal excision for rectal cancer? An observational study. Intl J Surg 2013; 11(5): 395-99.
11. Chang CC, Lan YT, Jiang JK, Chang SC, Yang SH, Lin CC, Lin HH, et al. Risk factors for delayed perineal wound healing and its impact on prolonged hospital stay after abdominoperineal resection. World J Surg Oncol 2019; 17(1): 226.
12. Colov EP, Klein M, Gögenur I. Wound complications and perineal pain after extralevator versus standard abdominoperineal excision. Dis Colon Rectum 2016; 59(9): 813-21.
13. Prytz M, Angenete E, Ekelund J, Haglind E. Extralevator abdominoperineal excision (ELAPE) for rectal cancer short-term results from the Swedish Colorectal Cancer Registry. Selective use of ELAPE warranted. Intl J Colorectal Dis 2014; 29(8): 981-87.
14. Asplund D, Prytz M, Bock D, Haglind E. Persistent perineal morbidity is common following abdominoperineal excision for rectal cancer. Intl J Colorectal Dis 2015; 30(11): 1563-70.
15. Aggarwal N, Seshadri RA, Arvind A, Jayanand SB. Perineal wound complications following extralevator abdominoperineal excision: experience of a regional cancer center. Ind J Surg Oncol 2018; 9(2): 211-14.
16. Artioukh DY, Smith RA, Gokul K. Risk factors for impaired healing of the perineal wound after abdominoperineal resection of rectum for carcinoma. Colorectal Dis 2007; 9(4): 362-67.
17. Mjoli M, Sloothaak DA, Buskens CJ, Bemelman WA, Tanis PJ. Perineal hernia repair after abdominoperineal resection: a pooled analysis. Colorectal Dis 2012; 14(7): e400-06.
18. Colov EP, Klein M, Gögenur I. Wound complications and perineal pain after extralevator versus standard abdominoperineal excision. Dis Colon Rectum 2016; 59(9): 813-21.
19. Perry WB, Connaughton JC. Abdominoperineal resection: how is it done and what are the results?. Clin Colon Rectal Surg 2007; 20(3): 213.