

Comparison of early and late removal of the urinary catheter after rectal cancer surgery

Comparación de la retirada precoz y tardía de la sonda urinaria tras la cirugía de cáncer rectal

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Abstract

Objective: This study is aiming to compare the results of early and late removal of urinary catheters after rectal cancer surgery. **Materials and methods:** Patients who undergone rectal cancer surgery in a single center were included in this prospective randomized study. The timing of the urinary catheter removal was randomized by a computer-assisted program and divided into 2 groups, which are early (first 48 h) and late (after 48 h). The primary outcome of this study was to compare the urinary retention and re-catheterization rates between patients with early and those with late catheter removal. **Results:** Sixty-six patients were included in this study. The median age was 60 (31-88 years), and the patient group was predominantly male (n: 40, 60.9%). Urinary retention after catheter removal developed in 8 (12%) of 66 patients. There was no difference between the two groups in terms of the need for re-catheterization (14% vs. 10%, p: 0.63). All the patients who required re-catheterization (n: 8) and were discharged with a urinary catheter (n: 4) were male. When the male and female patients were evaluated separately, there was no difference in urinary retention in the early or late groups. **Conclusions:** Early or late removal of the catheter does not play a role in the development of urinary retention in patients undergoing rectal cancer surgery.

Keywords: Rectal cancer. Catheter. Catheter removal time. Pelvic surgery.

Resumen

Objetivo: Comparar los resultados de la retirada precoz y tardía de la sonda urinaria tras la cirugía de cáncer rectal. **Método:** Estudio prospectivo aleatorizado que incluyó pacientes sometidos a cirugía de cáncer rectal en un único centro. El momento de la retirada de la sonda urinaria se aleatorizó y se dividió en dos grupos: primeras 48 horas y después de 48 horas. Se compararon las tasas de retención urinaria y de nueva cateterización entre los pacientes con retirada precoz y tardía de la sonda. **Resultados:** Se incluyeron 66 pacientes, con una mediana de edad de 60 años (31-88 años) y predominio del sexo masculino (n = 40, 60.9%). Se produjo retención urinaria tras la retirada de la sonda en 8 (12%). No hubo diferencias entre los dos grupos en cuanto a necesidad de nueva cateterización (14% frente a 10%, p = 0.63). Todos los pacientes que precisaron un nuevo cateterismo (n = 8) y fueron dados de alta con una sonda urinaria (n = 4) eran varones. **Conclusiones:** La retirada precoz o tardía de la sonda no influye en la aparición de retención urinaria en pacientes intervenidos de cáncer de recto.

Palabras clave: Cáncer rectal. Catéter. Tiempo de retirada del catéter. Cirugía pélvica.

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Introduction

Before abdominal surgery, a urinary catheter is usually inserted to allow for better visualization of the operative field. The catheter protects the bladder from injury and allows for easier monitoring of kidney function during and after surgery. Because of the high risk of nerve injuries resulting in urinary retention or bladder dysfunction, it is especially useful during rectal cancer surgery¹. The time to remove the catheter varies depending on the operation. The catheter is typically kept for 7 days because early removal of the urinary catheter has been linked to an increased risk of urinary retention^{2,3}.

Acute urinary retention affects approximately 20% of patients after abdominopelvic surgery⁴. Elderly patients and male patients with benign prostatic hypertrophy are at increased risk. It may cause bladder outlet obstruction by activating α -adrenergic receptors in the bladder neck through various mechanisms after pelvic surgery⁵. Therefore, a urethral catheter is placed during rectal surgery to prevent retention. However, urinary catheters are associated with an increased risk of urinary tract infection (UTI) with the duration of catheterization⁶. Enhanced recovery after surgery (ERAS) guidelines recommend withdrawal within 48 h of colon or rectal surgery post-operative period. Especially long-term catheters in place prolonged the hospitalization period of the patient and, at the same time, increased UTIs. The results of studies trying to determine the optimal duration of catheterization after rectal surgery are variable, and the risk-benefit balance of early catheter removal remains unclear⁷.

In this prospective randomized study, we aimed to compare the outcomes between the patients with early or late catheter removal.

Materials and method

This prospective randomized trial was conducted at a single center in Marmara University Hospital All patients who underwent elective rectal surgery between March 2021 and March 2022, either low anterior resection (LAR), Low very anterior resection (VLAR), or Abdominoperineal resection (APR), were included in the study. Randomization was performed according to a computer randomization program. Patients who have urgent surgery, a previous history of urinary tract malignancy, a chronic indwelling urethral

catheter, a neurogenic bladder, previous lower urinary tract surgery, a history of prior ureteral stent placement, and those who did not give consent to participate in this trial were excluded from the study.

A single dose of intravenous prophylactic antibiotics was given to all patients 1 h before the incision. Urinary catheters were placed before the incision. Catheter removal time was conducted according to a randomization scale. Urine culture and urine analysis were performed for all the patients after the removal of the urinary catheter.

Early removal was defined as the removal of the catheter within 48 h post-operative. Late removal was defined as the removal of the catheter after a period of 48 h.

Data including age, gender, body mass index (BMI), American Society of Anesthesiologists classification (ASA), neoadjuvant chemoradiotherapy, surgical approach (laparoscopic or open), type of surgery (LAR, VLAR, or APR), Foley catheter removal time, post-operative urinary retention, and post-operative hospital stay were collected prospectively.

The primary outcome of this study was to compare the urinary retention and re-catheterization rates between patients with early and those with late catheter removal. Secondary outcomes were investigating the possible associated factors may related to urinary retention after catheter removal.

This study was approved by Marmara university Ethics and Research committee also, registered in the Clinical Trial Identifier with no: NCT05020613.

Statistical analysis

We performed statistical analyses using the Statistical Package for Social Sciences for Windows version 20 (SPSS Inc.; Chicago, IL, USA). To compare categorical variables, two-tailed Chi-square or Fisher exact tests were used. An independent 2-sample t-test, or Mann–Whitney U, was performed for comparison of ordinal data. $p < 0.05$ were considered statistically significant.

Results

Between March 2021 and March 2022, 101 patients underwent rectal surgery. Among them, a total of 31 patients were excluded from the study because of urgent surgery, neurogenic bladder, and who did not give consent to participate in this trial. Four patients

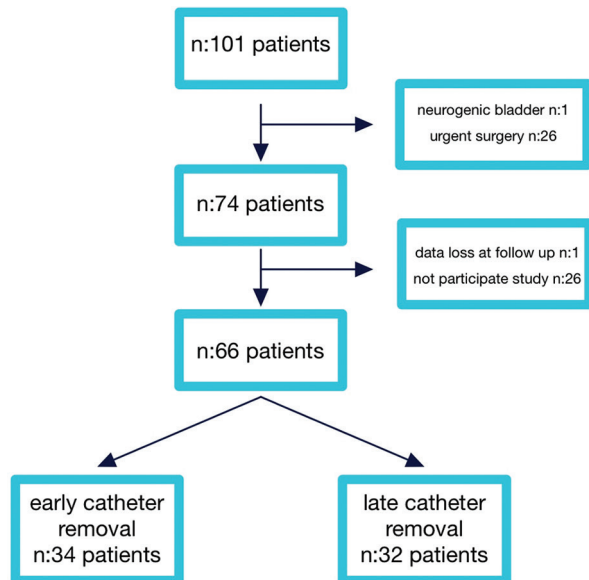


Figure 1. Flowchart of the study.

were excluded because of loss of follow-up during the study (Fig. 1).

A total of 66 patients were included in the study. There were 34 patients in the early catheter removal group and 32 patients in the late removal group. The median age of all cohorts was 60 (31-88 years), and the majority of patients (n = 40, 60.9%) were male. VLAR was performed in 15 (23%) patients, LAR in 39 (59%) patients, and APR in 12 (18%) patients. Only 2 (3%) patients underwent laparoscopic operation. Out of the 66 patients included, eight (12%) developed urinary retention after catheter removal. No significant difference was observed between the 2 groups regarding age, gender, BMI, ASA scores, and neoadjuvant chemotherapy.

No significant difference was found between the two groups in terms of urinary retention (14% vs. 10%, p: 0.63) (Table 1).

All the patients with urinary retention (n: 8) were male. Male and female patients were evaluated separately regarding urinary retention after catheter removal. No significant difference was observed between the 2 groups (early and late removal) in each gender regarding age, gender, BMI, ASA scores, and neoadjuvant chemotherapy. Furthermore, there was no significant difference between the two groups in terms of urinary retention (0% vs. 0%, p = 1.0) or (25% vs. 15%, p: 0.42) for each gender, respectively (Tables 2 and 3). Among 8 male patients who revealed urinary retention, only 3 (37%) had a history of BPH.

Table 1. Comparison of demographics and post-operative outcomes between early and late removal group

Variables	Early removal (n = 34)	Late removal (n = 32)	p-value
Age	61	58	0.38
Gender			0.76
Female	14 (41)	12 (37)	
Male	20 (59)	20 (62)	
BMI	27.2	27.7	0.67
ASA			0.32
1	1 (4)	4 (13)	
2	26 (77)	21 (65)	
3	7 (20)	7 (22)	
Neoadjuvant therapy	17 (53)	17 (50)	0.8
BPH presence	3 (8)	4 (12)	0.8
Operation type			0.42
VLAR	9 (26)	6 (18)	
LAR	21 (62)	18 (56)	
APR	4 (12)	8 (25)	
Tumor Stage			0.6
0	2 (6)	3 (9)	
1	8 (24)	4 (12)	
2	8 (23)	10 (31)	
3	15 (44)	14 (44)	
4	1 (3)	1 (3)	
Urinary Retention	5 (14)	3 (10)	0.5
Hospital Stay	6.6	5.9	0.3
Discharge with urinary Catheter	3 (9)	1 (3)	0.3

Discussion

This study prospective randomized study showed that urinary retention rates were similar in both early and late catheter removal groups in both genders.

Urinary catheter removal timing is still a controversial issue in both clinical studies and daily practice. Very few randomized prospective studies in the literature discuss this issue. Therefore, this prospective randomized study highlighted this issue and may fill the gap in the less discussed issue in the literature. Patients were evaluated separately according to gender, which may prevent selection bias during statistical analysis. The small sample size and small number of patients with laparoscopic approaches, the lack of power analysis, and the loss of data regarding epidural analgesia were the limitations of this study.

In recent studies, including randomized controlled studies, early removal of the urinary catheter was

Table 2. Comparison of demographics and post-operative outcomes between early and late removal group in female patients

Variables	Early removal (n = 14)	Late removal (n = 12)	p-value
Age	59	59	0.96
BMI	28.3	27.3	0.49
ASA			0.26
1	0 (0)	2 (17)	
2	12 (86)	9 (75)	
3	2 (14)	1 (8)	
Neoadjuvant Therapy	6 (43)	7 (58)	0.43
Operation Type			0.39
VLAR	1 (7)	3 (25)	
LAR	10 (71)	6 (50)	
APR	3 (22)	3 (25)	
Tumor stage			0.8
0	1 (7)	1 (8)	
1	3 (21)	2 (17)	
2	5 (36)	6 (50)	
3	4 (29)	3 (25)	
4	1 (7)	0 (0)	
Urinary retention	0	0	1.0
Hospital stay	4.9	5.9	0.27

Table 3. Comparison of demographics and post-operative outcomes between early and late removal group in male patients

Variables	Early removal (n = 20) (%)	Late removal (n = 20) (%)	p-value
Age	58	62	0.85
BMI	27	27.2	0.9
ASA			0.74
1	1 (5)	2 (10)	
2	14 (70)	12 (60)	
3	5 (25)	6 (30)	
Neoadjuvant Therapy	11 (55)	10 (50)	0.75
Operation Type			0.15
VLAR	8 (40)	3 (15)	
LAR	11 (55)	12 (60)	
APR	1 (5)	5 (25)	
Tumor Stage			0.59
0	1 (5)	2 (10)	
1	5 (25)	2 (10)	
2	3 (15)	4 (20)	
3	11 (55)	11 (55)	
4	0 (0)	1 (5)	
BPH presence	2 (10)	4 (20)	0.66
Urinary Retention	5 (25)	3 (15)	0.42
Hospital Stay (median) (range)	6 (4–22)	5 (3–14)	0.12

associated with increased urinary retention^{8,9}. While others claimed the opposite and reported contradictory results, early removal on post-operative day 1 was thought to be similar to late catheter removal⁸⁻¹⁰.

In the meta-analysis, although urinary retention rates were not different between the 1st and 3rd days post-operatively, significantly more retention was observed compared to the 5th day. On the contrary, UTI was much higher in the late group⁷. In a prospective study after pelvic surgery, three groups were compared. Post-operative 1, 3, and 5 days were selected for catheter removal. Urinary retention was higher on the 1st and the 5th days. It was concluded that the optimal timing was 3 days¹¹.

Operations such as APR and total proctocolectomy are associated with increased retention rates due to nerve dissection compared to other colorectal operations. In addition, operations performed for malignancy increase the size of the mesorectal dissection and therefore the risk of post-operative retention^{12,13}. Our study did not detect any difference between operations in terms of retention in patients who underwent rectal surgery. The ERAS protocol is now commonly

recommended for patients who have undergone colorectal surgery. In a recent study, which includes the ERAS protocol, it was also shown that the optimal timing for a urinary catheter was post-operative 3 days for improved urinary retention and infection rates¹⁴. In our study, early removal of the urinary catheter was not associated with increased urinary retention rates in patients undergoing rectal cancer surgery. This supported the data on early removal recommendations and consistent with the ERAS protocol. Although it is one of the components of ERAS protocol, epidural analgesia is suggested to be a risk factor for urinary retention¹⁵.

While older age, male gender, history of benign prostatic hyperplasia, and epidural anesthesia are considered as risk factors for retention¹⁵, none of them was shown to be a risk factor in this study, which could be explained by the small number of the study cohort. However, all the patients with urinary retention were male. In our study, there was no documented data regarding epidural analgesia, but it is usually applied routinely to patients who underwent open colorectal surgery in our practice.

In a recent prospective study, it was shown that urinary catheter removal after laparoscopic colorectal surgery is safe¹⁶. Nevertheless, in our study, the lack of a laparoscopic approach in the study cohort is considered as another limitation of the study. Further prospective randomized studies with a large number of patients are needed in the future.

Conclusion

This study showed that early urinary catheter removal is not associated with increased urinary retention rates. Thus, early catheter removal is safe and could be recommended after rectal cancer surgery.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. Right to privacy and informed consent. The authors have obtained approval from the Ethics Committee for the analysis and publication of routinely acquired clinical data, and informed consent was not required for this retrospective observational study.

Use of artificial intelligence for generating text.

The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript or for the creation of images, graphics, tables, or their corresponding captions.

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