



The impact of radiotherapy on lower urinary tract symptoms in patients with gynecologic malignancies: A cross-sectional study

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Abstract

This study investigates the impact of radiotherapy (RT) on lower urinary tract symptoms (LUTS) in patients with gynecologic malignancies, focusing on those who have undergone surgical treatment. We conducted a cross-sectional study from January to June 2023 at a tertiary hospital's outpatient polyclinic. Participants included patients with early-stage cervical cancer and endometrial cancer who received adjuvant RT post-surgery, and advanced cervical cancer patients who received primary RT. Patients were divided into two groups: those who received RT (RT (+)) and those who did not receive (RT (-)). Sociodemographic data were collected and LUTS were assessed using the International Consultation on Incontinence Questionnaire Female Lower Urinary Tract Symptoms (ICIQ-FLUTS). Out of 64 patients, 38 (59%) did not receive RT and 26 (41%) received RT. The RT (+) group had significantly higher scores in filling ($p=0.038$), voiding ($p=0.046$), and incontinence ($p=0.012$) compared to the RT (-) group. Additionally, the RT (+) group reported a significantly lower quality of life ($p=0.009$). Our study found that radiotherapy is associated with increased lower urinary tract dysfunction, including symptoms in the filling, voiding, and incontinence phases. Patients who received RT also experienced a decreased quality of life compared to the RT (-) group. These findings highlight the need for comprehensive management of LUTS in patients undergoing radiotherapy for gynecologic cancers.

Keywords: gynecological malignancy, endometrial cancer, cervical cancer, lower urinary tract symptoms, quality of life, radiotherapy

1. Introduction

Gynecologic cancers remain a significant global burden, impacting women socially and psychologically. Despite improvements in survival rates due to advances in healthcare technology, managing the health-related quality of life (HRQoL) of those affected is crucial. Treatment for gynecological malignancies frequently include surgical procedures, chemotherapy, and radiotherapy (RT). However, these interventions often lead to increased urological complications and affect HRQoL significantly (1).

Surgical interventions for gynecological cancers, such as radical hysterectomy and pelvic lymphadenectomy, are associated with a high incidence of urinary tract morbidity (2). Extensive surgeries can cause damage to urogenital nerves and blood vessels, leading to complications such as urinary incontinence, bladder dysfunction, and pelvic floor dysfunction (3). These complications can significantly affect the quality of life of survivors (4). Studies have demonstrated that radical surgical procedures contribute substantially to the urinary tract morbidity observed in gynecological cancer survivors (5).

Radiotherapy used as a curative, adjuvant, or salvage treatment for gynecological cancers, also causes significant side effects. It can damage living tissue in the treated area, resulting in increased collagen deposition, decreased elasticity, ischemia, necrosis, and permanent damage (6, 7). Patients undergoing RT may experience lower urinary tract symptoms (LUTS) such as dysuria, urgency, frequent urination, nocturia, and haematuria (8). These symptoms can lead to psychosocial issues and a decreased HRQoL (9, 10).

Lower urinary tract symptoms (LUTS) refer to a range of symptoms related to urinary tract dysfunction. These include symptoms associated with the filling phase of the bladder, such as increased frequency, urgency, and nocturia, and symptoms related to the voiding phase, such as hesitancy, weak stream, and incomplete bladder emptying. Additionally, incontinence and urinary leakage are considered part of LUTS. The impact of these symptoms can significantly affect patients' quality of life, causing discomfort and psychological distress.

Despite the growing recognition of the impact of these

symptoms, research on LUTS among cancer survivors, particularly those suffering from gynecological malignancies, remains limited. Therefore, this study aims to investigate the impact of radiotherapy on LUTS among patients with gynecological malignancies and to evaluate how these symptoms affect their HRQoL.

2. Materials and Methods

2.1. Study Design and Participants

This cross-sectional study was conducted from January to June 2023 at the outpatient polyclinic of the Gynecologic Oncology department at a tertiary hospital.

Inclusion criteria were as follows: (1) Patients with gynecological malignancies who visited the outpatient clinic during the study period. (2) Patients with early-stage cervical cancer who underwent adjuvant radiotherapy (RT) following radical hysterectomy. (3) Patients with endometrial cancer who received adjuvant RT after comprehensive surgical staging. (4) Patients with advanced cervical cancer who received primary RT.

Exclusion criteria were as follows: (1) Patients with diabetes mellitus, neurogenic bladder, interstitial cystitis, recurrence of cancer, urinary tract infection, urinary obstruction, vesicovaginal fistula, or a history of previous urologic or gynecologic surgery. (2) Patients unable to complete the questionnaire.

2.2. Radiotherapy Regimens

Patients with early-stage cervical cancer received adjuvant RT delivered as a total dose of 45-50.4 Gy in daily fractions of 1.8-2.0 Gy over approximately 5 weeks. Patients with advanced cervical cancer received primary RT delivered as a total dose of 45-50.4 Gy in daily fractions of 1.8-2.0 Gy. Patients with endometrial cancer received adjuvant RT delivered as a total dose of 45 Gy in daily fractions of 1.8 Gy over approximately 5 weeks.

2.3. Data Collection

Patients were categorized into two groups: RT (+) and RT (-). Data collected included sociodemographic information and LUTS using the International Consultation on Incontinence Questionnaire Female Lower Urinary Tract Symptoms (ICIQ-FLUTS).

2.4. ICIQ-FLUTS Questionnaire

A validated tool consisting of 12 items assessing three domains: filling (F score), voiding (V score), and incontinence (I score) (11, 12). This questionnaire was completed by patients in the waiting room area under the supervision of data collectors.

2.5. Clinical Examination

The patients were asked to complete the questionnaire in the waiting room area. After completing the questionnaire, patients underwent a detailed physical, gynecologic, and ultrasonographic examination. A urinalysis was performed to rule out urinary tract infections prior to the examinations.

2.6. Statistical Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used to present categorical variables as numbers and percentages and continuous variables as means and standard deviations. Comparative analyses between RT (+) and RT (-) groups were conducted using the Chi-square test for categorical variables, and the independent samples t-test for continuous variables. A p-value of <0.05 was considered statistically significant.

3. Results

A total of 64 patients were included in the final analysis. The mean patient age was 57.37 ± 11.1 , and 58.85 ± 11.82 years for Groups RT (-) and RT (+), respectively. There were no significant differences between the two groups with regard to age, body mass index, comorbidity, income, employment, consumption of coffee, smoking status, and educational level (Table 1).

Patients who received RT (+) had significantly higher filling ($p=0.038$), voiding ($p=0.046$) and incontinence scores ($p=0.012$) than patients who did not receive RT. The RT (+) group had a significantly decreased quality of life than the RT (-) group ($p=0.009$) (Table 2).

4. Discussion

Lower urinary tract dysfunction can have a significant impact on a patient's HRQoL, and may result in psychological, social, and sexual issues for women. Factors such as surgery and RT for gynecologic cancers may influence the prevalence of LUTS (13).

Numerous studies have evaluated the association between pelvic RT and LUTS (14, 15). In Hazelwinkel et al.'s study among cervical cancer survivors noted that treatment of cervical cancer impairs pelvic floor function, especially in patients treated with primary RT (16). Katepratoom et al conducted a cross-sectional study comparing patient groups treated with radical hysterectomy and chemoradiotherapy for cervical cancer. The study found voiding dysfunction to be significant only in those who received radical hysterectomy, while irritative storage urinary symptoms were more common in the chemoradiotherapy group (17). Our results suggested that RT might be detrimental to pelvic floor function and HRQoL of gynecological cancer survivors.

Table 1. Sociodemographic characteristics. Comparison of no radiotherapy and radiotherapy

	No Radiotherapy	Radiotherapy	Total	t	p	
Educational level	Illiterate	7 (58.3)	5 (41.7)	12 (100)	3.438	0.664
	Literate	4 (66.7)	2 (33.3)	6 (100)		
	Primary School	17 (63)	10 (37)	27 (100)		
	Secondary school	5 (71.4)	2 (28.6)	7 (100)		
	High School	2 (28.6)	5 (71.4)	7 (100)		
	University	3 (60)	2 (40)	5 (100)		
Marital status	Married	33 (63.5)	19 (36.5)	52 (100)	1.920	0.166
	Single	5 (41.7)	7 (58.3)	12 (100)		
Smoking	Yes	3 (50)	3 (50)	6 (100)	0.003	0.956
	No	35 (60.3)	23 (39.7)	58 (100)		
Daily coffee consumption	No consumption	24 (58.5)	17 (41.5)	41 (100)	0.222	1.000
	1-2 cups	12 (60)	8 (40)	20 (100)		
	3 or more cups	2 (66.7)	1 (33.3)	3 (100)		
Employment	Employed	3 (42.9)	4 (57.1)	7 (100)	0.286	0.593
	Unemployed	35 (61.4)	22 (38.6)	57 (100)		
Income	Income is less than expense	21 (60)	14 (40)	35 (100)	0.377	1.000
	Income is equal than expense	16 (59.3)	11 (40.7)	27 (100)		
	Income is more to expense	1 (50)	1 (50)	2 (100)		
Comorbidities	Yes	18 (56.3)	14 (43.8)	32 (100)	0.259	0.611
	No	20 (62.5)	12 (37.5)	32 (100)		
Cervical cancer		5 (23.8)	16 (76.2)	21 (100)	16.390	<0.001*
Endometrial cancer		33 (76.7)	10 (23.3)	43 (100)		
Age (year)		57.37±11.1	58.85±11.82	57.97±11.33	-0.51	0.612
Body mass index (kg/m²)		31.12±6.78	29.26±7.84	30.37±7.23	1.01	0.317

Note: Data are given as mean±SD and number (frequency). p<.05statistically significant

Table 2. Filling, voiding and incontinence scores. Comparison of no radiotherapy versus radiotherapy

	No Radiotherapy Mean±SD	Radiotherapy Mean±SD	Total Mean±SD	t	p
Filling Score	10.24±8.87	15.77±12	12.48±10.53	-2.121	0.038
Voiding Score	1.58±2.33	2.85±2.6	2.09±2.51	-2.036	0.046
Incontinence Score	7.82±12.11	19.04±19.13	12.38±16.19	-2.651	0.012
ICIQ-FLUTS Score	25.03±27.41	49.65±40.14	35.03±35.06	-2.724	0.009

Abbreviations: International Consultation on Incontinence Questionnaire Female Lower Urinary Tract Symptoms, ICIQ-FLUTS

p-value<.05statistically significant.

Our study supports the findings of Donovan et al. and Alicja Zi etek-Strobl et al., stating that gynecological oncological survivors frequently experience urinary incontinence that significantly reduces general HRQoL (3, 18). These survivors are more likely to exhibit symptoms of incontinence of every type. Our study, utilizing the ICQ-FLUTS questionnaire, confirmed that RT adversely affects LUTS. The findings align with the conclusions presented by Ereksn et al., who reported a prevalence of urinary symptoms as high as 83.6% among women undergoing treatment for endometrial cancer (19). Moreover, women receiving adjuvant RT reported experiencing more severe incontinence symptoms and greater impact on their HRQoL. The extension of life of oncology survivors who often received radical treatment for gynecological malignancies results in an elevated risk of pelvic floor dysfunction. Therefore, LUTS symptoms should be a matter of concern for healthcare professionals as they may decrease the HRQoL and cost-effectiveness of treatment (20).

Abdominal hysterectomy with bilateral salpingo-oophorectomy is the most commonly performed surgical

procedure in patients with gynecological cancer. When necessary, this procedure can be extended to include pelvic lymphadenectomy, removal of paracolpium, or debulking surgery. However, these extensive surgeries are associated with a higher rate of surgical complications and injuries to adjacent tissues, and contribute to an increased probability of urogynecological symptoms (21, 22). Radical pelvic surgery aims to decrease the malignancy recurrence but may also result in damage to urogenital nerves and blood vessels. This can lead to tissue hypoxia, scarring, and local ischemia, which increase the likelihood of pelvic floor dysfunction (23). Additionally, the combined treatment of surgery, RT, and chemoradiation can have negative effects on the lower urinary tract and pelvic floor organs. The risk of complications after pelvic radiation is inevitable and significantly affects the genitourinary system. Patients may experience various immediate or long-term adverse effects after treatment, such as urinary, stress urinary incontinence, interstitial cystitis, urinary bladder fibrosis, and vesico/urethra-vaginal fistulas (24). The literature lacks consensus on the impact of RT on LUTS. The findings of the

study suggest that RT may increase LUTS. Erekson and Manchana have reported that RT reduces pelvic floor function and HRQoL of cancer survivors (19, 24). However, other studies have disputed these findings (25-27). The PORTEC-2 study performed by De Boer et al. revealed a higher incidence of LUTS in gynecological oncology patients but did not result in a negative impact on their HRQoL (28). This aligns with the findings presented in the study conducted by Pisani et al., which examined a sample of patients with both cervical and endometrial cancer (29).

The small sample size of patients is a limitation of our study. However, using a validated questionnaire to evaluate LUTS represents a significant advantage. In addition, it may be beneficial to counsel oncology patients and prepare them for the potential complications or adverse events that may be associated with their treatment.

The present study suggested that patients receiving RT for gynecologic malignancies exhibited significant dysfunction in filling, voiding, and incontinence phases of lower urinary tract function compared to those who did not receive RT. Gynecologic oncological surgical procedures, such as radical hysterectomy and comprehensive staging surgeries, contribute to higher rates of urogynecological symptoms, which can be further exacerbated by RT. From a clinical perspective, these findings highlight the need for comprehensive management strategies that address both RT-related and surgical symptoms, as well as proactive patient counseling regarding potential side effects. Future research need to prioritize longitudinal studies to gain a deeper understanding of the long-term effects of RT, evaluate the efficacy of various symptom assessment tools, and explore potential interventions to improve patient outcomes and quality of life.

Ethical Statement

The database management in accordance with privacy legislation and the presented study in accordance with the ethical principle of the Declaration of Helsinki. Ethical approval for this study was obtained by the Research Ethics Committee (Approval number: 2023/514/259/2; Date: 11.10.2023). The work has not been published previously and it is not under consideration for publication elsewhere.

Conflict of interest

The authors have no conflicts of interest.

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Authors' contributions

Concept: S.S.K., E.K., M.A., Design: S.S.K., E.K., M.A., Data Collection or Processing: S.S.K., E.K., İ.B., M.M., B.K., U.K.O., Analysis or Interpretation: K.N.B., S.S.K., E.K., Literature Search: S.S.K., E.K., İ.B., M.M., B.K., Writing:

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