The effects of simple and radical hysterectomy and radiotherapy on lower urinary tract symptoms and urodynamics

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Summary

Purpose: To evaluate effects of simple/radical hysterectomy, radiotherapy, and their combination on lower urinary tract symptoms (LUTS) and urodynamics. *Materials and Methods:* Four groups were formed as simple hysterectomy; Group 1 (n = 20), Type-II hysterectomy; Group 2 (n = 11), Type-II hysterectomy + radiotherapy; Group 3 (n = 16), radiotherapy; Group 4 (n = 20). LUTS, bladder diary, pad test, Q-tip test, stress-test, urodynamics, bladder-wall-thickness measurement, King's Health Questionnaire (KHQ) performed prior and at six and 18 months after treatment. *Results:* Pre-treatment prevalence of LUTS was higher in Group 1 and decreased at six and 18 months. LUTS increased in Groups 2, 3, and 4 at six months; some of the symptoms decreased to pre-treatment levels at 18 months. Quality of life improved in Group 1 and worsened in the others. Maximum bladder capacity increased in Group 1 and decreased in Groups 2 and 3. Bladder-wall-thickness, maximum detrusor pressures increased, urine sensation decreased in Groups 2 and 4. Maximum vesical pressure increased and compliance decreased in Groups 2 and 3. *Conclusion:* LUTS may decrease after simple hysterectomy. Radical hysterectomy and radiotherapy result in voiding dysfunction; however some of the symptoms may decrease to pre-treatment levels during follow-up.

Key words: Cervical cancer; Endometrium cancer; Hysterectomy; Lower urinary tract dysfunction; Radiotherapy; Urinary incontinence.

Introduction

Urinary incontinence (UI) is defined as the involuntary loss of urine that is a social or a hygienic problem [1]. The prevalence of UI is affected by age, parity, obesity, smoking, menopausal state, and previous gynecologic or surgical operations. In addition, gynecologic neoplasms and their surgical and non-surgical treatments are associated with UI. There are three possible mechanisms in this association; the direct invasion of the neoplasm, the mass effect of the neoplasm leading to urinary tract compression, and short and long-term effects of treatment modalities leading to temporary or permanent urinary tract symptoms [2].

Simple hysterectomy and radical hysterectomy have been evaluated for their effects on lower urinary tract functions [2, 3]. A decrease in bladder sensations and flow rate, incomplete emptying, and stress urinary incontinence or urge urinary incontinence may develop after surgery [4]. Radiotherapy (RT) also has an important role in the treatment of gynecologic neoplasms and may lead to acute and chronic lower urinary tract problems such as irritative symptoms and nocturia, pollakiuria, dysuria, and diminished bladder capacity [5, 6].

In recent years, survival rate after gynecologic malignancies has increased. In addition to increase in survival rate and life expectancy, it has become quite important for these patients to maintain their quality of life. It is well-known that lower urinary tract symptoms including UI lead to a decrease in quality of life in patients. In this study, the authors aimed at evaluating the effects of simple hysterectomy, radical hysterectomy, RT, and combined treatment modalities on lower urinary tract symptoms and urodynamics.

Materials and Methods

Sixty-seven patients applying to the Istanbul University, Istanbul Medical Faculty Department of Obstetrics and Gynecology and Department of Radiation Oncology were included in this prospective study. Informed consent was obtained from all patients. Ethics approval was obtained from the Istanbul University Ethics Committee on July 6, 2005.

Patients were divided into four groups according to the procedure performed. Group 1 (n = 20) and Group 2 (n = 11) underwent simple hysterectomy for benign gynecologic conditions and type II hysterectomy for either endometrial or cervical carcinoma, respectively. All the procedures were performed by laparatomy. Group 3 (n = 16) underwent simple/radical hysterectomy, pelvic ± para-aortic lymphadenectomy and omentectomy for either endometrial or cervical carcinoma and received adjuvant RT. Group 4 (n = 20) received primary RT for Stages IB2, II, and III cervical carcinoma. The former FIGO staging was used while the new staging system was not available during this study. The Foley catheter was removed one day after simple hysterectomy and ten days after type II hysterectomy. All the complications that developed during or after the surgeries were noted.

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For RT, total mean 4,500-5,000 cGy dosage with daily 180-200 cGy doses was given. Dosages of 8,500-9,000 cGy was given on the vaginal stumph for brachytherapy and 5,000-6,000 cGy was given for the parametrium and pelvic side walls. All the complications that developed during or after RT were noted.

Pelvic organ prolapse evaluation with Baden-Walker-Halfway-System, bladder diary, stress-test, Q-tip-test, one-hour pad test, pelvic floor muscle strength measurement, cystometry, uroflowmetry, and bladder-wall-thickness measured with Doppler ultrasonography was performed in each group pre-treatment and at six and 18 months after treatment. Urodynamics was performed using MMS UD 2000 urodynamics system.

Bladder wall thickness was measured with transvaginal ultrasonography (TVUS) using a 5-9 MHz transvaginal probe. Bladder wall thickness was measured in the lithotomy position after the patients emptied their bladder. All measurements were done at maximum magnification. The bladder wall thickness was measured perpendicular to the bladder lining at the thickest parts of the trigone, dome, and anterior wall of the bladder [7].

The King's Health Questionnaire (KHQ) has been developed to assess quality of life and includes 21 questions organized in nine domains including general health, incontinence impact, role limitations, personal limitations, social limitations, personal relationship, emotions, sleep and energy, severity of measures, and global score. Each domain has a separate score that ranges from 0 to 100. The KHQ has a specific domain, which specially investigates UI symptoms [8]. KHQ validated in Turkish was used to assess the impact on the quality of life [9].

Statistical analysis

Statistical analysis was performed with the computer program Statistical Package for the Social Sciences (SPSS) 15.0 for Windows by a professional statistician. Data were expressed as mean ± standard deviation. One-Way Analysis Test (ANOVA), Kruskal Wallis, Paired t-test, Fisher's exact test, Wilcoxon rank, and Chi-squared test were used for statistical analysis. A *p* value less than 0.05 was considered statistically significant.

Results

Sixty-seven patients were included in the study. Fifty Group 1 (n = 16), Group 2 (n = 11), Group 3 (n = 12), Group 4 (n = 11), and 55 patients Group 1 (n = 19), Group 2 (n = 10), Group 3 (n = 15), Group 4 (n = 11) participated in the urogynecologic examination at six and 18 months after treatment, respectively.

The demographic variables of the groups are summarized in Table 1. The mean age of the patients was similar. Ten patients (50%) in Group 1, three patients (27.3%) in Group 2, six patients (37.5%) in Group 3, and three patients (15%) in Group 4 had second-degree prolapse. Mean body mass index (BMI) of Group 3 was significantly higher than the other groups at pre-treatment evaluation and at six months. However, at 18 months, mean BMI of Group 1 was significantly higher than the pre-treatment level and other groups. Q-tip test was positive in all of the patients before treatment. Stress-test was positive in two patients in Group 1, one patient in Group 2, and three patients in Group 3. None of the patients had undergone anti-incontinence or surgery for pelvic organ prolapse.

Table 1. — *Demographic variables of the four groups.*

	Group 1	Group 2	Group 3	Group 4	*p*
Age	48.9 ± 7.5	50.0 ± 6.7	57.0 ± 8.9	46.3 ± 8.6	0.002*
Parity	3.2 ± 1.6	2.6 ± 1.4	3.1 ± 1.6	2.9 ± 1.9	0.473*
Menopause	3 (15%)	5 (45.5%)	11 (68.8%)	3 (15%)	< 0.001Δ
Postmenopausal period (years)	7.5 ± 4.8	9.6 ± 5.7	10.8 ± 6.6	9.0 ± 4.6	0.788*
Urogenital Atrophy					
Pretreatment	2	2	7	2	0.039
6 months	2	2	10	10	0.002
18 months	6	3	12	12	0.016
Body mass index					
Pretreatment	32.3 ± 6.8	28.2 ± 4.9	36.0 ± 7.3	29.8 ± 5.3	0.012*
6 months	32.9 ± 7.1	28.4 ± 4.4	36.6 ± 7.2	30.1 ± 4.1	0.033*
18 months	34.4 ± 6.4	28.6 ± 4.7	36.4 ± 7.9	32.1 ± 7.6	0.057*
p	0.039*	0.702*	0.464*	0.236*	

* Student's t test.
Δ Fischer's exact test

Table 2. — *Distribution of patients in Group 3 according to stage, grade, and histology of tumors.*

Stage - Grade - Histology	Number of patients (n)
IB grade 2 endometrioid type endometrial adenocarcinoma[A]	2
IC grade 1 endometrioid type endometrial adenocarcinoma[A]	5
IC grade 2 endometrioid type endometrial adenocarcinoma[A]	2
IIB grade 1 endometrioid type endometrial adenocarcinoma[A]	1
IIA grade 2 endometrioid type endometrium adenocarcinoma + IC serous cystadenocarcinoma[A]	1
IC grade 2 serous papillary endometrial carcinoma[A]	1
IIIA grade 2 serous papillary endometrial carcinoma[A]	1
IIB grade 3 undifferentiated endometrial carcinoma[A]	1
In situ grade 2 squamous cell cervical carcinoma (positive surgical borders)[B]	1
IB2 grade 2 squamous cell cervical carcinoma LVSI (+), surgical border < 1 cm*	1

[A] Total abdominal hysterectomy, pelvic lymphadenectomy, and total omentectomy
[B] Total abdominal hysterectomy
* Type II hysterectomy
LVSI: lymph vascular space invasion.

The indications for hysterectomy in Group 1 were leiomyomas (n = 7, 35%), ovarian cysts (n = 3, 15%), atypical endometrial hyperplasia (n = 2, 10%), dysfunctional uterine bleeding (n = 2, 10%), and Stage IA endometrial cancer (n = 6, 30%). The distribution of patients in Group 2 according to Stage and grade of tumors was as follows; two patients (18.1%) Stage 1A2 grade 1, four patients (36.3%) Stage 1B1 grade 1, four patients (36.3%), Stage 1B1 grade 2, and one patient (9%) Stage 1B2 grade 2 squamous cell cervical carcinoma. The surgical treatment and the results of the postoperative histopathologic evaluation of Group 3 who underwent hysterectomy + RT are summarized in Table 2. Nine patients (56.3%) received brachytherapy, five patients (31.2%) received RT + brachytherapy, and two patients (12.5%) received chemotherapy in addition to brachytherapy + RT. Group 4 received only RT + chemotherapy for advanced stage cervical carcinoma. Nine patients (45%) had Stage IB1 and IB2, eight patients (40%) had Stage II, and three patients had Stage III cervical cancer. Mean combined dosage was 4,320 cGy in Group 3 whereas it was 8,859 cGy in Group 4.

Lower urinary tract symptoms of the patients are sum-

Table 3. — *Results of the King's Health Questionnaire total score pre-treatment at six and 18 months after treatment.*

	Group 1	Group 2	Group 3	Group 4	*p*
Before treatment	22.5 ± 17.5 (n = 20)	9.1 ± 13.2 (n = 11)	19.9 ± 23.2 (n = 16)	7.4 ± 7.9 (n = 20)	0.022*
6 months	14.2 ± 12.8 (n = 16)	26.9 ± 16.7 (n = 11)	20.2 ± 14.6 (n = 12)	8.4 ± 7.3 (n = 11)	0.019*
18 months	17.3 ± 18.5 (n = 19)	23.1 ± 21.1 (n = 10)	22.2 ± 28.3 (n = 15)	12.0 ± 11.9 (n = 11)	0.730

Table 4. — *One-hour pad test results before treatment and at six and 18 months after treatment. Results are expressed in grams.*

	Pre-treatment	6 months	18 months
Group 1	9.5 ± 21.9	5.2 ± 12.9	0.3 ± 0.8
Group 2	0.4 ± 1.2	11.5 ± 16.4	10.1 ± 19.2
Group 3	1.9 ± 6.9	6.0 ± 14.2	14.3 ± 28.4
Group 4	2.8 ± 7.3	4.3 ± 7.1	0.2 ± 0.6
p	0.083	0.657	0.176

Table 5. — *Pre-treatment cystometry results of the four groups.*

Pre-treatment	Group 1 (n = 20)	Group 2 (n = 11)	Group 3 (n = 16)	Group 4 (n = 20)	*p*
First sensation of urine (ml)	148.1 ± 52.07	183.5 ± 55.79	209.3 ± 88.81	195.1 ± 54.79	0.079
Strong sensation of urine (ml)	441.25 ± 69.98	431.73 ± 52.38	389.64 ± 122.18	417.33 ± 65.67	0.031
Max bladder capacity (ml)	533.95 ± 85.76	522.82 ± 76.11	505.07 ± 72.26	507.39 ± 65.41	0.062
Max vesical pressure (cm H_20)	133.00 ± 30.35	126.27 ± 24.20	120.00 ± 24.69	115.44 ± 33.39	0.352
Max detrusor pressure (cm H_2O)	44.25 ± 17.00	43.73 ± 15.49	43.86 ± 22.67	48.83 ± 14.89	0.019
Compliance (ml/cm H_2O)	74.51 ± 49.75	78.44 ± 47.36	72.54 ± 27.04	85.29 ± 35.32	0.007

Table 6. — *Cystometry results of the four groups at six months.*

6 months	Group 1 (n = 16)	Group 2 (n = 11)	Group 3 (n = 12)	Group 4 (n = 11)	*p*
First sensation of urine (ml)	142.57 ± 26.97	131.91 ± 32.77	202.00 ± 107.59	145.64 ± 85.47	0.123
Strong sensation of urine (ml)	404.57 ± 72.57	373.40 ± 91.18	399.08 ± 101.49	368.55 ± 72.06	0.412
Max bladder capacity(ml)	512.79 ± 75.81	440.45 ± 87.53	472.83 ± 63.77	436.64 ± 118.51	0.041*
Max vesical pressure (cm H_20)	132.14 ± 43.12	144.00 ± 19.53	135.67 ± 31.11	127.55 ± 20.69	0.403
Max detrusor pressure (cm H_2O)	44.79 ± 16.04	61.55 ± 28.87	43.83 ± 21.82	71.09 ± 32.23	0.033*
Compliance (ml/cm H_2O)	75.76 ± 59.69	36.37 ± 28.11	69.24 ± 56.68	42.94 ± 31.32	0.199

* Maximum bladder capacity increased in Group 1 whereas decreased in Groups 2 and 4.
* Maximum detrusor pressures in Groups 2 and 4 increased.
* Compliance decreased in Groups 2 and 3.

Table 7. — *Cystometry results of the four groups at 18 months.*

18 months	Group 1 (n = 19)	Group 2 (n = 10)	Group 3 (n = 15)	Group 4 (n = 11)	*p*
First sensation of urine (ml)	176.72 ± 67.49	128.80 ± 60.23	190.20 ± 99.79	143.82 ± 59.92	0.176
Strong sensation of urine (ml)	421.44 ± 65.55	332.00 ± 149.65	291.80 ± 176.24	334.40 ± 137.82	0.204
Max bladder capacity (ml)	505.11 ± 48.90	384.50 ± 159.55	402.60 ± 156.60	367.82 ± 136.30	0.013
Max vesical pressure (cm H_20)	147.78 ± 41.83	132.90 ± 28.58	146.53 ± 29.77	114.09 ± 32.01	0.134
Max detrusor pressure (cm H_2O)	46.61 ± 34.76	55.90 ± 22.52	66.20 ± 47.93	45.91 ± 13.96	0.314
Compliance (ml/cm H_2O)	89.51 ± 46.25	28.31 ± 30.08	53.69 ± 42.06	26.40 ± 29.99	0.001

* Maximum bladder capacity and compliance of Group 1 increased.
* No difference was observed in compliance. urine sensation. maximum vesical and detrusor pressures.

marized in Figure 1. Pre-treatment stress and urge UI, urgency, frequency, pad usage, and coital leakage were higher in Group 1. UI, urgency, nocturia, dysuria, pad usage increased in Group 2 at six months. There was an increase in obstructive symptoms such as 63.6% of the patients had hesitancy, 72.7% of the patients had voiding dysfunction and intermittent stream. These symptoms except for nocturia and slow stream decreased to pre-treatment levels at 18 months. The urinary frequency, pad usage, nocturia increased in Group 3 at six months; some of the symptoms decreased to pre-treatment levels at 18 months. Urgency, frequency, urge UI, nocturia, dysuria, recurrent urinary tract infections, straining for voiding, slow urinary stream increased in Group 4 at six months and some of the symptoms regressed at 18 months. Three patients in Group 4 had hematuria and two patients developed mild hemorrhagic cystitis that responded to medical treatment. Also, one patient in Group 2 and two patients in Group 4 sufferred from fecal incontinence at 18 months.

The pre-treatment total score of KHQ was significantly higher in Groups 1 and 3 (Table 3). At six months, the total score of Groups 2 and 3 was significantly higher. At 18 months, the total score of KHQ was higher than the baseline in Groups 2, 3, and 4, but had decreased from the levels at six months in Groups 2 and 4.

No significant difference was observed in the one-hour pad test results before and at six and 18 months after treatment (Table 4). Urgency episodes increased in the bladder diaries in Group 2 at six months. The pre-treatment bladder-wall-thickness measured was similar between groups. At six and 18 months after treatment, the bladder-wall-thickness was significantly higher in Groups 2 and 4.

The pre-treatment uroflowmeter results were similar between groups and no significant difference was observed after treatment, but there was a decrease in mean flow rate at six months in Group 2. There was no difference among the four groups in the pre-treatment cystometry analysis except for the first sensation of urine which was significantly lower in Group 1 (Table 5). At the first urodynamic evaluation, one patient (5%) from Group 1 had urodynamic stress urinary incontinence (SUI). One patient (5%) from Group 1, two patients (18.2%) from Group 2, three patients (18.75%) from Group 3, and one patient (5%) from Group 4 had detrusor overactivity.

At six months after treatment, the maximum bladder capacity of Group 1 increased (Table 6). Group 2 showed a decrease in the maximum bladder capacity, and compli-

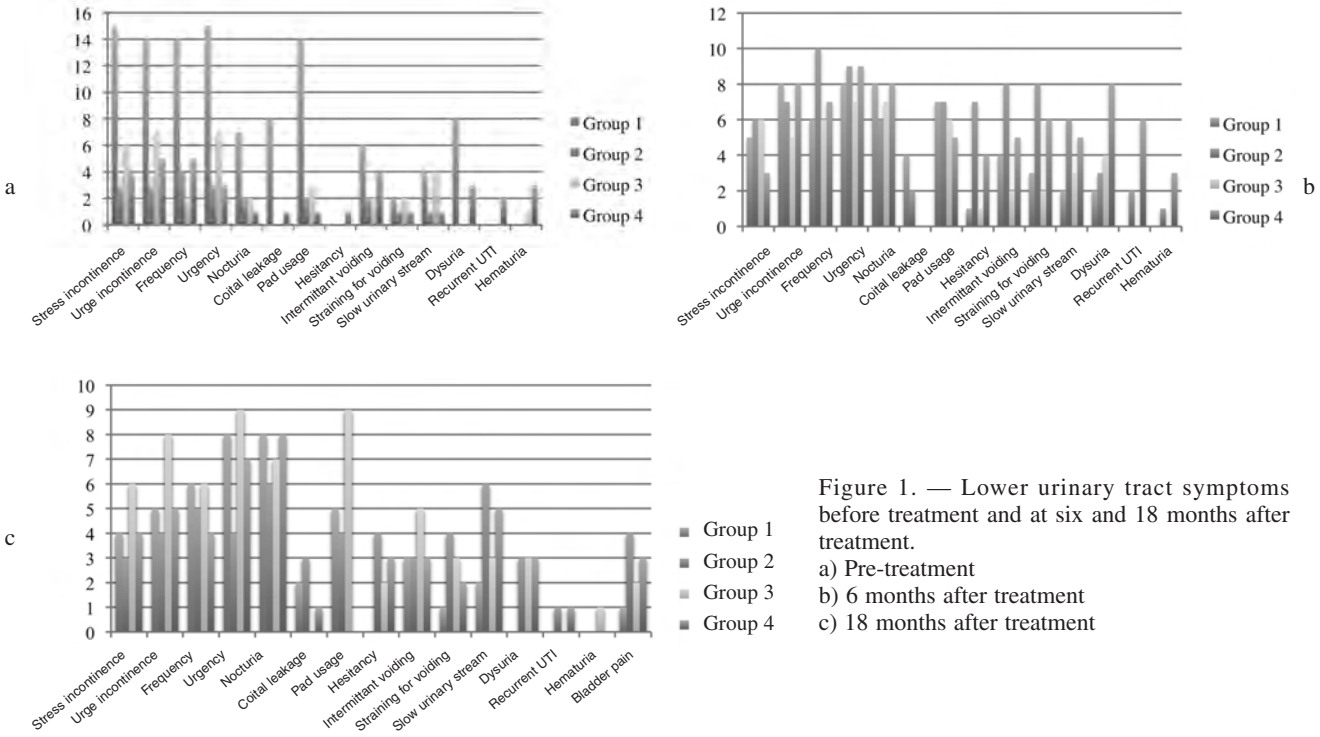

Figure 1. — Lower urinary tract symptoms before treatment and at six and 18 months after treatment.
a) Pre-treatment
b) 6 months after treatment
c) 18 months after treatment

ance and an increase in the maximum vesical pressure and residual urine volume. Maximum detrusor pressures of Groups 2 and 4 were significantly higher than the other groups. Nineteen of the patients had UI during cystometry. One patient had mixed UI whereas the rest of the patients had detrusor overactivity.

The cystometry results at 18 months after treatment showed a significant difference in maximum bladder capacity in Group 1 (Table 7). In Group 2, obstructive voiding pattern, decrease in urinary flow rate, and high residual urine volume disappeared, but decrease in maximum bladder capacity and compliance and abnormalities in sensation of urine persisted. Almost half of the patients developed urgency and urge urinary incontinence.

De novo SUI developed in two patients in both Groups 3 and 4 at 18 months after treatment. Two patients had type III SUI and two patients had type I SUI. At 18 months, the incidence of UI in Group 1 was 21%, in Group 2 was 50%, in Group 3 was 50.3%, and in Group 4 was 63.6%. There was no SUI in Group 2.

The patients suffering from UI as a late complication were offered treatment. Five patients received anticholinergic treatment and bladder training. One of the patients suffering from SUI underwent transobturator tape operation in Group 3 and received anticholinergic treatment after surgery.

Intraoperative bladder injury occurred in only one patient in Group 1 and was repaired during the operation. No postoperative complications developed. One patient in Group 2 had a lymphocele at the left iliac region leading to grade 2 hydronephrosis and a unilateral double-J catheter was introduced. One patient in Group 3 receiving brachytherapy and estrogen replacement therapy (ERT) developed radiation cystitis. Two patients in Group 4 with advanced cervical cancer died during the study due to bilateral grade 3 hydronephrosis and acute renal failure. Ureterovaginal fistula and unilateral grade 3 hydronephrosis developed in one patient in Group 4, six months after RT. Bilateral double-J catheter was introduced.

Discussion

UI may accompany gynecologic tumors and has an adverse effect on the quality of life and psychologic, social, and general well-being. Anatomical closeness makes lower urinary tract symptoms quite common in advanced stage gynecologic neoplasms [10]. In addition, surgery, RT, and chemotherapy lead to temporary or permanent lower urinary tract symptoms [2].

The authors could not find any detrimental effect of simple hysterectomy on lower urinary tract symptoms and urodynamics. On the contrary the prevalence of pretreatment symptoms was highest in Group 1, but these symptoms decreased at six and 18 months after the operation. The increase in BMI was linked to postmenopausal changes in the basal metabolic rate seen after bilateral salpingo-oopherectomy [11].

There are studies with contradictory results regarding the effects of simple hysterectomy on the lower urinary tract. It was suggested that simple hysterectomy led to

lower urinary tract dysfunction [12]. However prospective studies have not supported this idea [13-17]. In the only prospective study suggesting an association between UI and simple hysterectomy, the incidence of urinary symptoms increased from 58% to 75% [18]. In a recent meta-analysis, no association between hysterectomy and UI was found in women younger than 60 years of age [19].

There was a significant increase in the maximum bladder capacity after simple hysterectomy. The patients that developed detrusor overactivity at six and 18 months already had low compliance during the pre-treatment evaluation. The only patient that developed SUI had chronic pulmonary disease and an increase in BMI after surgery. According to these results, the authors can say that simple hysterectomy does not have an adverse effect on lower urinary tract function. El-Toukhy et al suggested that lower urinary tract symptoms occurred less frequently and urodynamic studies remained unchanged after hysterectomy [20].

The discrepancy between clinical findings may be seen because of a couple of factors such as hysterectomies performed in the old age group in whom lower urinary tract symptoms are nonetheless commonly encountered, the reduction of pelvic organ prolapse after hysterectomy, and the misinterpretation of short-term effects [21]. Another factor is that most of the patients relate their lower urinary tract symptoms to their hysterectomy date. In addition, if the indication for hysterectomy leads to more severe symptoms, the patient may put off mild UI.

The radical hysterectomy group (Group 2) showed a decrease in the maximum bladder capacity, mean flow rate, compliance, and an increase in the maximum vesical pressure, residual urine volume, urgency, urinary incontinence episodes, and obstructive symptoms. At the 18 month evaluation, obstructive voiding pattern, decrease in urinary flow rate, and high residual urine volume disappeared, but a decrease in maximum bladder capacity and compliance and abnormalities in sensation of urine persisted.

Radical hysterectomy may lead to lower urinary tract symptoms as high as 80% in some series [2]. The most significant morbidity in the postoperative period has been bladder dysfunction including loss of bladder sensations, hypertonic bladder, hypo/acontractile bladder, urgency, and SUI [22]. However; approximately 80% of women do not report their symptoms as bothersome [2]. Changes in the intrinsic sphincter functions are thought to be responsible for the development of UI after radical hysterectomy [23]. Decrease in maximal urethral closure pressure, flow rates, compliance, and a significant increase in maximum intravesical filling pressure and residual urine volume have been observed [24]. However, these changes may normalize during follow-up. In one study, UI following radical hysterectomy showed a significant spontaneous improvement rate within the first 12 months following surgery. Urodynamics should be a mandatory investigation in patients who complain of persisting problems thereafter [25].

Nerve-sparing radical hysterectomy techniques may eliminate these lower urinary tract symptoms seen after radical hysterectomy [26, 27]. The aim of contemporary oncologic surgery should be to minimize the morbidity and adverse effects on quality of life while performing optimal surgery.

RT has early and late effects on bladder and urethral functions. In Group 3, there was a significant decrease in bladder capacity and an increase in intravesical pressure and resting detrusor pressures at six months. The results showed that at six months radical hysterectomy alone led to more severe symptoms, but the results of Groups 2 and 3 were similar at 18 months. In a study on the short-term effects of RT on urinary symptoms and urodynamic assessment, voiding dysfunction was more common after radical hysterectomy and radical hysterectomy + RT group as compared to RT group [28]. Bladder compliance was significantly reduced in those patients receiving more than 3,000 rads to the entire bladder from RT.

Group 4 had a significant increase in bladder wall thickness, resting detrusor pressures, UI episodes, and a decrease in flow rate and compliance. At 18 months, there was a further decrease in the first sensation of urine, strong sensation of urine, maximum bladder capacity, and compliance, but there was no significant difference between Groups 2 and Group 4 regarding the reduced bladder capacity and obstructive symptoms.

The maximum bladder capacity and compliance was significantly lower and maximum detrusor pressure was higher in Group 4 when compared with Group 3 at 18 months. This might be due to the difference in dosage and the chosen route of treatment in primary and adjuvant RT. In a study evaluating the effect of RT on bladder functions with urodynamics, UI developed in all of the patients at two years after RT [29]. Radiation fibrosis of the bladder and reduction in bladder capacity was thought to be responsible and symptoms could be at least partially reversible in some patients. No change was observed in urethral closure pressures and the SUI cases were attributed to pre-treatment SUI.

The authors could not show a relation between simple and radical hysterectomy and SUI. In contrast; in the two groups receiving RT, SUI was observed after treatment. SUI after RT might be related to bladder neck fibrosis, damage to urethral mucosa, and decrease in compliance [30].

Fecal incontinence was observed in two patients in Group 4 and in one patient in Group 2. Damage to pelvic autonomic nervous system by RT or radical hysterectomy may lead to fecal incontinence and colorectal dysfunction [26].

The quality of life was worsened at six and 18 months except for the patients in Group 1. KHQ has a special domain that evaluates the effect of urinary symptoms on the quality of life. Therefore the detrimental effect on the quality of life might be attributed to an increase in lower urinary tract symptoms in these patients.

The number of patients in this study was quite restricted. Studies with more patients and longer follow-up are needed for more accurate results. While treating malig-

nant disease, the aim should include increasing survival without affecting the quality of life. The understanding of the exact mechanism of urinary dysfunction may result in decreasing or preventing dysfunction. Lower urinary tract symptoms developing after treatment may be severe and require treatment.

Conclusion

Simple hysterectomy does not lead to lower urinary tract symptoms, instead lower urinary tract symptoms present before treatment may decrease after simple hysterectomy without affecting the urodynamic parameters. Radical hysterectomy and RT alone or in combination result in UI, urgency, frequency, and obstructive symptoms with decrease in bladder capacity and compliance; however some of the obstructive symptoms may regress during follow-up.

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