EJMI

DOI: 10.14744/ejmi.2021.32395
EJMI 2021;5(2):240–245

Research Article

The Impacts of Radical Gynecologic Surgery and Radiotherapy on Lower Urinary Tract of Patients with Cervix and Uterine Cancer

Hulusi Goktug Gurer,[1] Ceren Yildiz Eren,[1] Ozlem Ozgur Gursoy,[1] Omer Tarik Yalcin[2]

[1]Department of Obstetrics and Gynecology, Eskisehir Acibadem Hospital, Eskisehir, Turkey
[2]Department of Obstetrics and Gynecology, Eskisehir Osmangazi University, Eskisehir, Turkey

Abstract

Objectives: To analyze lower urinary system complications after hysterectomy and radiotherapy in patients with cervix and uterine cancer.

Methods: Our prospective study included urogynecologic symptoms assessment and urodynamic findings of 70 cases before and after surgery, radiotherapy or combined treatment.

Results: After the treatment of uterine and cervix cancer either by surgery or radiotherapy, the complains of frequency, nocturia, dysuria and urgency were not found to be statistically significant differences ($p>0.05$). However the capacity and the compliance of the bladder were found to be decreased significantly after radiotherapy and combined therapy ($p<0.05$). The number of patients with stress incontinence after surgery and combined treatment and the number of patients with mixed incontinence after combined treatment were not found to be statistically significant differences ($p>0.05$). However the number of patients with detrusor overactivity after radiotherapy and combined therapy increased significantly when compared those treatments by radical surgery ($p<0.05$).

Conclusion: Lower urinary tract dysfunction could occur after the surgical or radiotherapy treatment of gynecologic cancers and the patients should be informed for those adverse effects.

Keywords: Urodynamic study, radical hysterectomy, pelvic irradiation, urologic morbidity

Cite This Article: *Gurer HG, Yildiz Eren C, Ozgur Gursoy O, Yalcin OT. The Impacts of Radical Gynecologic Surgery and Radiotherapy on Lower Urinary Tract of Patients with Cervix and Uterine Cancer. EJMI 2021;5(2):240–245.*

Endometrium cancer is the most prevalent gynecologic cancer and the 16th most common cancer among women and the 20th leading cause of cancer death in women worldwide.[1]

Cervical cancer is the 8th most frequently occurring malignancy and cancer death in women.[1,2] By the help of primary prevention attempts (prophylactic HPV vaccination) and secondary prevention (HPV screening and treatment of cervical precancerous lesions), its incidence and mortality dramatically decreased in the last decades.

In most women, treatment of endometrial cancer and early stage cervical cancer is primarily surgery including primary hysterectomy and bilateral salpingo-oophorectomy, often using minimally invasive approaches. Lymph node dissection is contingent on histological factors, disease stage and patients' characteristics followed by radiation therapy.[3,4] Choice of treatment is determined by the stage and grade of cancer, patient's age and recurrence risk. Although the

Address for correspondence: Hulusi Goktug Gurer, MD. Eskisehir Acibadem Hastanesi Kadin Hastaliklari ve Dogum Klinigi, Eskisehir, Turkey
Phone: +90 532 470 05 20 **E-mail:** hulusi.gurer@acibadem.com

Submitted Date: April 14, 2021 **Accepted Date:** June 05, 2021 **Available Online Date:** July 12, 2021

©Copyright 2021 by Eurasian Journal of Medicine and Investigation - Available online at www.ejmi.org
OPEN ACCESS This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

prognosis is excellent, it has been well documented that the prevalance of long-term complications due to these treatment modalities are high. Among these complications, pelvic floor dysfunction has the highest prevalance, reported as 8-85%.[5] Damages to the hypogastric nerves due to radical resection, postoperative edema, necrosis or vascular damage secondary to fibrosis after radiotherapy have the critical role in this occurance.

Aim of our study is to analyze lower urinary system symptoms and urodynamic findings after uterine and cervix cancer treatment.

Methods

Between March 2005 and June 2007, 70 patients treated in Eskişehir Osmangazi University Medical Faculty Division of Gynecologic Oncology were enrolled in this case-control study. Of these, 40 patients had endometrium cancer, 24 had cervical cancer and 6 had uterine sarcoma. After ethical approval and informed consent were obtained, patients were evaluated with urodynamic study before treatment. Patients were allocated for the treatment according to their clinical status as: 55 were treated with only surgery (group A), 20 of them received only pelvic irradiation (group B) and 30 were exposed to combined surgery and radiotherapy (group C). 8 weeks after the treatment, cases were questioned about the symptoms and reevaluated urodynamically.

At first, demographic status of cases were analyzed and questioned whether they had urinary dysfunction or illness before that can trigger it. Incontinence Impact Questionnaire (IIQ-7) form was used before and after therapy. Postvoiding residue (PVR) volume was measured by a sterile catheter. Bladder function was assessed with MMS (Medical Measurement Systems) multichannel computerised cystometry and ultrasound was done by using a transperineal 3.5-MHz probe (ESAOTE, Italy) in all groups 2 weeks before therapy. Urodynamic assessment included uroflowmetry in a spontaneous voiding, filling and voiding cystometry.

Women in group A and C underwent hysterectomy with pelvic-paraaortic lymph node disection. These hysterectomies were performed by the same three surgeons (H.G.G., Ö.T.Y., S.Ö.)

Urogynecological assessment was performed again with the same method, 8 weeks after the surgery in group A, 8 weeks after the last dose of radiotherapy (RT) in group B and C.

Statistical analyses were performed using Statistical Package for the Social Sciences: (SPSS) for Windows 13.0 (SPSS Inc., Chicago , IL, USA). Statistical analysis included data expressed as the mean±S.D.S. Groups were evaluated by the Factorial ANOVA method, Kruskall-Wallis, Wilcoxon test, paired t test and independent t test as indicated. Value of $p<0.05$ was considered statistically significant.

Results

Our study included 70 women treated for gynecologic cancers. Of these, 40 (%57.1) had endometrial cancer, 24 (%34.2) had cervical cancer and 6 (%8.6) had uterine sarcoma. The number of patients according to their surgical stage of endometrium cancer and uterine sarcoma, clinical stage of cervical cancer were shown in Table 1.

The mean age of 70 patients was 57.7±10.2 (31-78). Cases were grouped according to their treatment and analyzed before and after treatment.

In the postoperative period, some of the symptoms of the ower urinary tract disease, found to be increased (Table 2). Among incontinence, stress incontinence incidence increment was not statistically significant ($p>0.05$).

After RT, all of the incontinence symptoms incidence increment was not found to be statistically significant ($p>0.05$) as shown in Table 2. Among incontinence, only urge incontinence increased, stress and mixed type incontinence incidence recorded as same.

In combined therapy group, all of the incontinence symptoms found to be increased but these increments were statistically significant only in frequency and nocturia symptoms ($p<0.05$) (Table 2). Mixed incontinence was seen at most after treatment.

Stress incontinence incidence after surgery or combined

Table 1. Cases according to their surgical and clinical stages of gynecologic cancers

Endometrium Cancer (n=40)			Cervix Cancer (n=24)			Uterine Sarcoma (n=6)		
Stage	**n**	**%**	**Stage**	**n**	**%**	**Stage**	**n**	**%**
Ia	12	30	Ib1	9	37.5	I	3	50
Ib	10	25	Ib2	3	12.5	III	2	33.4
Ic	12	30	IIa	2	8.3	IV	1	16.6
III	4	10	IIb	7	29.2			
IV	2	5	III	3	12.5			

therapy are statistically nonsignificant (p>0.05). RT found to be ineffective in the appearance of stress incontinence.

In addition, mixed type incontinence incidence in combined treatment group was found to be statistically nonsignificant (p>0.05). Detrussor overactivity augmentation after RT and after combined therapy was not found to be statistically non-significant (p>0.05). In contrast, detrussor overactivity prevalence increment was statistically significant in RT and combined therapy when compared with radical surgery (p<0.05).

In our study we found out no statistically significant decrease in maximal bladder capacity (from 446.0 ml to 414.1 ml) after radical hysterectomy (p>0.05) as shown in Table 3.

We performed urodynamic tests before and after RT and cystometric parameters are shown in Table 3. Tests showed a decrease in maximal bladder capacity (from 478.7 mL to 408 mL) and it was statistically significant (p<0.05). In addition, bladder compliance decrease from 24.8 ml/cm H_2O to 20.1 ml/cm H_2O which was also statistically significant (p<0.05). We also found no statistically significant increment both in the maximal vesical and detrusor pressures (p>0.05).

Urodynamic test parameters before and after combined therapy are shown in Table 3. We performed urodynamic tests two months after surgery and adjuvant RT. Test results showed a decrease in maximal bladder capacity (from 431.5 mL to 369.8 mL) and bladder compliance (from 24.7 ml/cmH2O to 18.9 ml/cm H_2O) and both of them are statistically significant (p<0.05). PVR didnot increase in all groups (Table 4).

Discussion

RH or RT or combined surgery and adjuvant RT in gynecologic cancers cause urinary system disorders that may lead to serious psychological, social, and sexual problems in women.[6-9]

Additionally, advanced age is a risk factor that increase the prevalance of incontinence. In our study, the mean patient age was 57.7±10.2 (31-78) years. Hysterectomies performed in old age aggravate the side effects on the bladder function.[10–12]

De Noronha et al., studied impacts of the treatment modalities of invasive cervix cancer on pelvic floor functions. Prospective study pointed out that the impact on the pelvic floor function depends more on the type of treatment than on the stage of the tumor.[13] In conjuction with this opinion, we scrutinized the effects of treatment types, not the stages of tumors.

Villena-Heinsen et al., performed urodynamic assess-

Table 2. Urogynecologic symptoms after hysterectomy - after RT - Combined Therapy

	Group A (RH) (n=55)					Group B (RT) (n=20)					Group C (Combined Therapy) (n=30)				
	Before treatment		After treatment			Before treatment		After treatment			Before treatment		After treatment		
	n	%	n	%	p	n	%	n	%	p	n	%	n	%	p
Frequency	17	30.9	22	40	>0.05	5	25	8	40	>0.05	7	23.3	13	43.3	<0.05
Nocturia	28	50.9	30	54.5	>0.05	9	45	13	65	>0.05	13	43.3	21	70	<0.05
Dysuria	5	9	8	14.5	>0.05	1	5	2	10	>0.05	3	10	6	20	>0.05
Urgency	12	21.8	15	27.2	>0.05	4	20	8	40	>0.05	5	16.6	9	30	>0.05
Stranguria	3	5.4	3	5.4	>0.05	0	0	1	5	>0.05	1	3.3	2	6.6	>0.05
Pad usage	5	9	6	10.8	>0.05	2	10	3	15	>0.05	3	10	6	20	>0.05
Urge incontinence	12	21.8	14	25.4	>0.05	4	20	6	30	>0.05	6	20	7	23.3	>0.05
Stress incontinence	15	27.2	19	34.5	>0.05	5	25	5	25	>0.05	6	20	8	26.6	>0.05
Mixed incontinence	6	10.9	8	14.5	>0.05	2	10	2	10	>0.05	3	10	7	23.3	>0.05

Table 3. Cystometric parameters after hysterectomy - after RT - Combined Therapy

	Group A (RH) (n=55)			Group B (RT) (n=20)			Group C (Combined Therapy) (n=30)		
	Before treatment	After treatment		Before treatment	After treatment		Before treatment	After treatment	
	Mean±SD	Mean±SD	p	Mean±SD	Mean±SD	p	Mean±SD	Mean±SD	p
Maximal bladder capacity (ml)	446.0±55.7	414.1±86.3	>0.05	478.7±48.8	408.2±68.1	<0.05	431.5±77.1	369.8±105.0	<0.05
Maximal vesical pressure (cmH_2O)	22.1±9.3	23.5±10.6	>0.05	17.4±8.5	21.0±6.6	>0.05	26.8±15.8	28.5±15.7	>0.05
Maximal abdominal pressure (cmH_2O)	13±5.1	8.9±6.7	>0.05	12.8±5.1	12±7	>0.05	14.9±8.8	10.1±4.3	>0.05
Maximal detrusor pressure (cmH_2O)	16.2±10.3	16.3±5.9	>0.05	17.0±16.0	22.4±15.9	>0.05	17.2±13.5	23.7±13.7	>0.05
Bladder compliance (ml/cmH_2O)	25.4±15.3	22.3±12.3	>0.05	24.8±13.0	20.1±14.2	<0.05	24.7±17.5	18.9±11.5	<0.05

ment pre and postoperatively in 33 patients who underwent RH. They found out that the maximal bladder capacity decrease from 615 ml to 503 ml. They also found a temporary decrease in maximal urinary flow and detrusor pressure and a delay in the first urge to urinate.[14]

In our study, we performed urodynamic tests two months after surgery and found statistically non-significant decrease in maximal bladder capacity (p>0.05).

Farquharson et al., studied RT side effects on bladder and urethral functions in cervical cancer patients. 30 patients, underwent only RH, compared with 30 patients received only RT, and 30 patients treated with RH and adjuvant RT with respect to urodynamics and symptoms. Voiding disorders and loss of urinary sensation were recorded more in the RH group and the RH plus adjuvant RT group. The only difference between the RH group and the RH plus adjuvant RT group was about bladder compliance but the difference was insignificant as well. Six months after treatment the incontinence rates were 23% in the RT group, 26% in the RH group, and 63% in the RH plus adjuvant RT group.[15]

In our study, we performed urodynamic tests before and after radiotherapy and found a decrease in maximal bladder capacity (from 478.7 mL to 408 mL) and it was statistically significant (p<0.05). Bladder compliance decrease from 24.8 ml/cm H_2O to 20.1 ml/cm H_2O which was also statistically significant (p<0.05). Additionally, we also found statistically non-significant increment both in the maximal vesical and detrusor pressures (p>0.05).

Lin et al., did not find any differences in detrusor instability or bladder compliance in women submitted to the RH and/or RT, evaluated by urodynamics.[16]

We performed urodynamic tests two months after radical hysterectomy and adjuvant RT and found a decrease in maximal bladder capacity (from 431.5 mL to 369.8 mL) and bladder compliance decrease (from 24.7 ml/cm H_2O to 18.9 ml/cm H_2O) both of them are statistically significant (p<0.05). Maximal detrusor pressure increment recorded to be statistically non-significant (from 17.2 cm H_2O to 23.7 cm H_2O) (p>0.05).

As a result, maximal bladder capacity and bladder compliance found to be decreased in all groups but only in RT and combined treatment groups, they reached significance statistically which are consistent with the literature.

Emirdar et al., performed urodynamic studies before, and 6 months after radiotherapy. Bladder capacity was decreased significantly in all subjects, and mostly in combined therapy group including radical pelvic surgery with the lowest dose of radiation (mean decrease in capacity from 600 to 490 mL).[17] Stress incontinence rates increased from 28–

Table 4. Post-void residue volume before and after treatment in all groups

	Group A		Group B		Group C		p
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	
PVR (ml)	27±6.5	35±8.9	25±9.3	22±7.5	20±7.2	28±8.3	>0.05

39% in the radical surgery group, and from 40–70% in the abdominal hysterectomy and radiotherapy group. Radiotherapy patients had no stress incontinence before or after treatment. However, we found that stress incontinence incidence after surgery or combined therapy was statistically non-significant (p>0.05). RT found to be ineffective in the appearance of stress incontinence.

In addition, increment in mixed type incontinence of combined treatment group was recorded to be statistically non-significant (p>0.05). But detrussor overactivity prevalence increment was statistically significant in RT and combined therapy when compared with radical surgery (p<0.05). This is probably due to effects of RT on bladder function.

Due to long life expectancy after successful therapy in gynecologic cancer patients, we should also deal with the complications of the therapy. Our study aimed to point out the most frequently seen of them; lower urinary tract problems. During follow-up these patients, we should be aware of with these problems. However, limited number of patients enrolled and short follow-up time of them are the limitations of our study. As a result, with similar participants further studies needed to corroborate these findings.

Disclosures

Acknowledgment: This article is produced from our thesis. We would like to thank to Ceren Yıldız Eren and Ozlem Ozgur Gursoy. They took part in the preparation of the article for publication.

Ethics Committee Approval: Ethics Commitee Approval Our study was conducted in accordance with the Declaration of Helsinki and it was reviewed and approved by the Ethics Committee of the Eskişehir Osmangazi University Faculty of Medicine (2007).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – H.G.G.; Design – H.G.G.; Supervision – H.G.G.; Materials – H.G.G., C.Y.E.; Data collection and/or processing – H.G.G., C.Y.E.; Analysis and/or interpretation – H.G.G., C.Y.E.; Literature search – O.O.G., C.Y.E.; Writing manuscript – O.O.G., C.Y.E.; Critical review – H.G.G., C.Y.E, O.O.G.

References

1. World Health Organization. Globocan 2020 - Global Cancer Observatory. Available on: https://gco.iarc.fr/today/data/factsheets/populations/900-world-fact-sheets.pdf. (Accessed)
2. World Health Organization. Human papillomavirus (HPV) and cervical cancer. Available on: http://www.who.int/mediacentre/factsheets/fs380/en/. (Accessed June 10, 2016).
3. American College of Obstetricians and Gynecologists. ACOG practice bulletin, clinical management guidelines for obstetrician-gynecologists, number 65, August 2005: management of endometrial cancer. Obstet Gynecol 2005;106:413–25.
4. Kim HS, Kim K, Ryoo SB, Seo JH, Kim SY, Park JW, et al; FUSION Study Group. Conventional versus nerve-sparing radical surgery for cervical cancer: a meta-analysis. J Gynecol Oncol 2015;26:100–10.
5. Zullo MA, Manci N, Angioli R, Muzii L, Panici PB. Vesical dysfunctions after radical hysterectomy for cervical cancer: a critical review. Crit Rev Oncol Hematol 2003; 48:287–93.
6. Vervest HA, Barents JW, Haspels AA, Debruyne FM. Radical hysterectomy and the function of the lower urinary tract. Urodynamic quantification of changes in storage and evacuation function. Acta Obstet Gynecol Scand 1989;68:331–40.
7. Chen KK, Chang LS, Chen MT, Huang JK, Yuan CC, Tsai KH, et al. Prospective urodynamic study before and after radical hysterectomy. Zhonghua Yi Xue Za Zhi (Taipei) 1988;41:333–8.
8. Hamada K, Kihana T, Takeda Y, Inoue Y, Matsuura S, Kataoka M, et al. [Urodynamic study on urinary disturbance after therapy of uterine cancer]. Nihon Sanka Fujinka Gakkai Zasshi 1992;44:440–6. [Article in Japanese]
9. io S, Yoshioka S, Nishio S, Yokoyama M, Iwata H, Takeuchi M. [Urodynamic evaluation for bladder dysfunction after radical hysterectomy]. Nihon Hinyokika Gakkai Zasshi 1993;84:535–40. [Article in Japanese]
10. Brown JS, Sawaya G, Thom DH, Grady D. Hysterectomy and urinary incontinence: a systematic review. Lancet 2000;356:535–9.
11. van der Vaart CH, van der Bom JG, de Leeuw JR, Roovers JP, Heintz AP. The contribution of hysterectomy to the occurrence of urge and stress urinary incontinence symptoms. BJOG 2002;109:149–54.
12. Kjerulff KH, Langenberg PW, Greenaway L, Uman J, Harvey LA. Urinary incontinence and hysterectomy in a large prospective cohort study in American women. J Urol 2002;167:2088–92.
13. Noronha AF, Mello de Figueiredo E, Rossi de Figueiredo Franco TM, Cândido EB, Silva-Filho AL. Treatments for invasive carcinoma of the cervix: what are their impacts on the pelvic floor functions? Int Braz J Urol 2013;39:46–54.

14. Villena-Heinsen C, Metzgeroth GS, Tossounidis I, Berner K, Schmidt W. Urodynamic parameters and continence after radical Wertheim-Meigs-Okabayashi hysterectomy. Zentralbl Gynakol 1997;119:476–82. [Article in German]
15. Farquharson DI, Shingleton HM, Orr JW Jr, Hatch KD, Hester S, Soong SJ. The short-term effect of radical hysterectomy on urethral and bladder function. Br J Obstet Gynaecol 1987;94:351–7.
16. Lin HH, Sheu BC, Lo MC, Huang SC. Abnormal urodynamic findings after radical hysterectomy or pelvic irradiation for cervical cancer. Int J Gynaecol Obstet 1998;63:169–74.
17. Emirdar V, Nayki U, Ertas IE, Nayki C, Kulhan M, Yildirim Y. Urodynamic assessment of short-term effects of pelvic radiotherapy on bladder function in patients with gynecologic cancers. Ginekol Pol 2016;87:552–8.