



Original article

# Orthotopic neobladder vs. ileal conduit urinary diversion: A long-term quality-of-life comparison

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## Abstract

**Purpose:** The optimal form of urinary diversion following radical cystectomy remains controversial. We sought to compare the long-term health-related quality-of-life outcomes between patients with orthotopic neobladder and ileal conduit diversion (ICD).

**Patients and methods:** We enrolled 95 patients following radical cystectomy and ICD ( $n = 49$ ) or orthotopic neobladder reconstruction (ONR) ( $n = 46$ ), with a minimum interval of 1 year from surgery. All patients completed the Bladder Cancer Index questionnaire, assessing their urinary, bowel, and sexual function, and bother scores.

**Results:** Patients treated with ONR were generally younger and healthier compared with those who underwent ICD ( $P < 0.01$ ). Sex, marital status, disease status at the time of enrollment, and mean duration elapsing from surgery to interview were similar between the subgroups. Better functional scores in favor of ICD were recorded in the urinary domain ( $P < 0.01$ ), whereas the corresponding bother scores were roughly identical in both groups. Conversely, although higher functional scores were recorded in the sexual domain of patients with ONR ( $P < 0.01$ ), the corresponding bother scores in this group were lower compared with their counterparts with ICD (53.2 vs. 65.3;  $P < 0.05$ ). As patients grew older they were more likely to report on better urinary function and worse sexual function, but were less likely to be bothered by the decline in sexual function.

**Conclusions:** Our study suggests that the bother resulting from urinary incontinence and the risk of sexual dysfunction be highlighted to those electing for neobladder reconstruction, whereas patients preferring conduit diversion should be reassured that their expected quality of life is not compromised. © 2015 Elsevier Inc. All rights reserved.

**Keywords:** Quality of life; Urinary diversion; Bladder Cancer Index

## 1. Introduction

Radical cystectomy (RC) followed by urinary diversion (UD) with or without the addition of systemic chemotherapy is the primary therapy for muscle invasive bladder cancer [1,2]. The optimal type of UD after RC is still considered highly controversial, as any form of diversion would have detrimental ramifications on the overall well-being, body image, or self-esteem, and most importantly, urinary function and sexual activity. Although these changes

inevitably affect the individual patient's quality of life [3], they are often difficult to measure and quantify. Health-related quality of life (HRQoL) remains a complex end point, taking into account not only the patients' physical and emotional status, but also their general and mental health, as well as their social interactions [4]. Several studies have attempted to compare the HRQoL in patients with various types of UD, but a definitive conclusion has not been reached [3,5]. *As no type of UD has been proven superior over the other, the optimal choice remains a daunting task.*

Recently, a newly developed HRQoL instrument for use in patients with bladder cancer was introduced [6]. This tool allows for a reliable and reproducible comparison of subjective outcomes, thereby providing patients and their

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counseling physicians with valuable information when selecting their preferred type of UD. The aim of our study was to compare HRQoL between patients who underwent orthotopic neobladder reconstruction (ONR) or ileal conduit diversion (ICD) following RC using the validated bladder cancer–specific functional index questionnaire.

## 2. Methods

### 2.1. Study sample

After institutional review board approval, all living patients who underwent RC and UD between 2004 and June 2012 were contacted via telephone and asked to participate in the present study. All patients underwent either ICD or ONR by the same surgical team. The choice of diversion was made following a comprehensive discussion with the patients and their families, considering the individual preferences while acknowledging the known contraindications for ONR. In addition, *it is our policy to perform a nerve-sparing procedure in all the patients considered as candidates for ONR.* Based on the findings of Kulaksizoglu et al. [7], who determined that the adaptation of patients to their newly formed UD is expected to stabilize at 1 year, a minimum interval of 12 months was required between the date of surgery and the time when patients were first contacted. Each of the patients provided a written informed consent before study participation. A total of 3 consecutive phone calls, each 1 week apart, and a written letter were used in an attempt to contact nonresponders.

The medical files were reviewed for preoperative (age, sex, disease status, laboratory data, and preoperative pathology), perioperative (surgery duration, complications, and morbidity), and postoperative data (laboratory, pathological data, and functional and oncological outcomes).

### 2.2. HRQoL measurement

HRQoL was measured using the Bladder Cancer Index (BCI) questionnaire. The BCI is a validated disease-specific instrument, which consists of 36 items within 3 primary domains measuring urinary (14 items), bowel (10 items), and sexual health (12 items); each of the primary domains consists of 2 subdomains addressing function and bother [8]. The function items focus on the frequency of disease symptoms, with answer scales ranging from “never” to “usually or always.” The bother items reflect the individual perception of these symptoms, categorized as “no problem, very small, small, moderate, or big problem.” The designers of the questionnaire developed an algorithm through which scores are generated by transforming the item responses into a 0 to 100 scale followed by calculating the mean of the standardized items [8]. In general, higher scores indicate an

overall better health status, i.e., higher functional performance and less bother. The urinary domain in patients with ileal conduit, for instance, assesses the stoma and application function by specifically measuring symptoms such as peristomal urine leakage and skin irritation that could result from suboptimal stomal placement.

### 2.3. Statistical analysis

Patients were divided into 2 groups: Group A with ICD and group B with ONR. Urinary, bowel, and sexual function and bother scores were measured and compared between the 2 groups using a 2-tailed analysis of variance. The effect of age on all scores was analyzed by using the Pearson correlation coefficient. *To further elucidate putative predictors of quality-of-life outcomes, multivariate stepwise linear regression analyses were performed analyzing the effect of clinical and pathological characteristics on urinary and sexual function and bother. Variables included age at surgery, the age-adjusted Charlson comorbidity score, operative time, pathological T stage, and neoadjuvant or adjuvant chemotherapy.* The level of statistical significance was set at 5% and all analyses were performed using SPSS software version 19.0 (SPSS Inc., Chicago, IL).

## 3. Results

Of the 203 patients who underwent RC during the study years, 42 patients (21%) succumbed to their cancer, 37 patients (18%) died of causes other than bladder cancer, 19 patients (9%) declined to participate, and 10 patients (5%) could not be reached, leaving 95 patients (47%) who consented to participate in the study. Complete demographic, operative, pathological, and follow-up data stratified according to UD type are presented in Tables 1 and 2. Median age in the overall cohort was 65 years (range: 44–85) and the mean (standard deviation) age-adjusted Charlson comorbidity score was 4.82 (1.57). Patients treated with ONR were generally younger and healthier compared with those who underwent ICD ( $P < 0.01$ ). Likewise, those with ONR were more likely to receive neoadjuvant chemotherapy ( $P = 0.024$ ) although there were no significant differences in pathological stage (the proportion of patients diagnosed with pT0 or lymph node metastasis) between the groups. Sex, marital status, and disease status at the time of enrollment were similar between both groups. *The mean duration elapsing from surgery to interview was similar between both groups (46.6 mo [20.5] in the ICD group and 44.4 mo [31.1] in the ONR group;  $P = 0.275$ ).*

Table 3 depicts the mean BCI scores in both groups. Significant differences were found in the urinary function subdomain with higher scores recorded in the ICD compared with ONR group (83.2 vs. 64.7, respectively;  $P < 0.01$ ). Patients in the ONR group were more likely to complain of daytime, and particularly nighttime, urine

Table 1  
Basic demographic and preoperative data

Characteristics	Ileal conduit	Neobladder	<i>P</i> value
Number of patients	49	46	
Median age, y (range)	72 (46–85)	61 (44–75)	0.0002
Sex			
Male, <i>n</i> (%)	44 (90)	44 (96)	NS
Female, <i>n</i> (%)	5 (10)	2 (4)	
Age-adjusted Charlson comorbidity index score, mean (SD)	5.4 (1.2)	4.1 (1.6)	0.004
Marital status, <i>n</i> (%)			
Married (%)	42 (86)	38 (83)	NS
Single/divorced/widower (%)	7 (14)	8 (17)	

SD = standard deviation; NS = nonsignificant.

leakage (Fig. 1). However, despite the significant difference in function, the bother scores in the urinary subdomain were roughly identical for both subgroups (73.6 and 73.4 in the ONR and ICD groups, respectively;  $P = 0.9$ ). Patients in both groups indicated that the UD had become a major detrimental factor, affecting adversely their social activity, their ability to perform exercise, and their sleep.

Overall outcomes related to the bowel domain were similar between the groups, including both function and bother (Table 3). The only observed difference was a reportedly lower frequency of bowel movements translating into increased bother by constipation in the ICD group compared with patients with ONR (Fig. 2,  $P < 0.01$ ).

Significant variation between the groups was observed in the sexual domain. Patients with ONR had a significantly higher level of sensation in the genital area and reported on

better ability to be sexually aroused than patients in the ICD group. Altogether, patients with ONR were more likely to report on higher functional scores (38.8 compared with 26.1 in patients with ICD;  $P < 0.01$ ), but on lower bother scores (53.2 compared with 65.3 in patients with ICD;  $P = 0.03$ ). Taken together, patients with ONR had an overall better sexual activity but were more bothered by their imperfect function than their counterparts in the ICD group (Fig. 3).

The Pearson correlation coefficient was used to assess the association between age and each domain score. A positive correlation was found between increasing age and the urinary function score ( $r = 0.331$ ,  $n = 95$ ,  $P = 0.001$ ) and sexual bother score ( $r = 0.4$ ,  $n = 95$ ,  $P < 0.001$ ). Conversely, a negative correlation was found between patients' age and the sexual function score ( $r = -0.416$ ,  $n = 95$ ,  $P < 0.001$ ). In other words, as patients grew older

Table 2  
Surgical, pathological, and follow-up data

Characteristics	Ileal conduit	Neobladder	<i>P</i> value
Mean surgery time, min (SD)	278 (73.4)	327 (68.7)	0.0014
Neoadjuvant chemotherapy, <i>n</i> (%)	5 (10)	13 (28)	0.024
Adjuvant chemotherapy, <i>n</i> (%)	5 (10)	9 (19.5)	NS
Histology, <i>n</i> (%)			
No evidence of disease	13 (26.5)	11 (24)	NS
Urothelial carcinoma	35 (71.5)	35 (76)	
Other histology	1 (3)	0	
pT stage, <i>n</i> (%)			
T0	13 (26.5)	11 (23.9)	
Tis	6 (12.2)	3 (6.5)	
T1	8 (16.3)	8 (17.4)	NS
T2	11 (22.4)	13 (28.3)	
T3	7 (14.3)	10 (21.7)	
T4	4 (8.2)	1 (2.2)	
N stage, <i>n</i> (%)			
N0	46 (93.9)	38 (82.6)	
N1	1 (2)	3 (6.5)	NS
N2	2 (4.1)	5 (10.9)	
Mean time, mo, from surgery to study enrollment (SD)	46.6 (20.5)	44.4 (31.1)	NS
Disease status at enrollment, <i>n</i> (%)			
No evidence of disease	47 (96)	43 (93)	NS
Alive with disease	2 (4)	3 (7)	

SD = standard deviation; NS = nonsignificant.

Table 3  
Mean-adjusted BCI domain scores (0–100)

BCI score	Ileal conduit group mean scores	Neobladder group mean score	P value
<i>Urinary domain</i>			
Function (SD)	83.3 (12)	64.7 (14.4)	<0.0001
Bother (SD)	73.4 (16)	73.6 (16.8)	NS
<i>Bowel domain</i>			
Function (SD)	55.5 (9)	53 (11)	NS
Bother (SD)	74.3 (10)	74.3 (13)	NS
<i>Sexual domain</i>			
Function (SD)	26.1 (20.4)	38.8 (21.6)	0.004
Bother (SD)	65.3 (26.6)	53.2 (26.5)	0.029

SD = standard deviation; NS = nonsignificant.

they were more likely to report on better urinary function combined with worse sexual function, but, apparently, were less likely to be bothered by the decline in their sexual function. Marital status, age-adjusted Charlson comorbidity score, and the pathological stage had no effect on BCI scores in both groups. *On multivariate age at surgery, the urinary and sexual function domain scores,  $F(2, 89) = 10.622, P = 0.005$ , and  $F(2, 89) = 12.578, P < 0.001$ , respectively, were statistically significantly predicted. For each 1-year increase in age, there was an increase in the urinary function domain score of 0.49 and a decrease in the sexual function domain score of 9.37 points. Neoadjuvant*

*therapy decreased the sexual function domain score by 11.419 points.*

Despite the observed BCI scores' variation between the 2 groups, when asked specifically about regret, none of the patients would have considered, in retrospect, a different type of UD than the one they had originally chosen.

#### 4. Discussion

The effect of cancer-specific therapy on HRQoL is extremely important to patients and their health care providers. Despite the availability of numerous HRQoL instruments, many lack relevant content for measuring treatment-related dysfunction and bother [9]. The BCI questionnaire has overcome many of these shortcomings. It is specific to bladder cancer, thus targeting the commonly associated bladder cancer treatment symptoms [8]. It is sensitive to the major differences among the various treatment modalities, thus applicable to both sexes and all forms of UDs. Lastly, it provides researchers with a robust measure of urinary, bowel, and sexual outcomes, thus becoming an ideal tool for comparative effectiveness in bladder cancer trials [9].

Expectedly, our results reflect a considerable selection bias regarding the choice of UD. Younger and healthier patients tended to prefer ONR and were more likely to receive neoadjuvant chemotherapy compared with the older

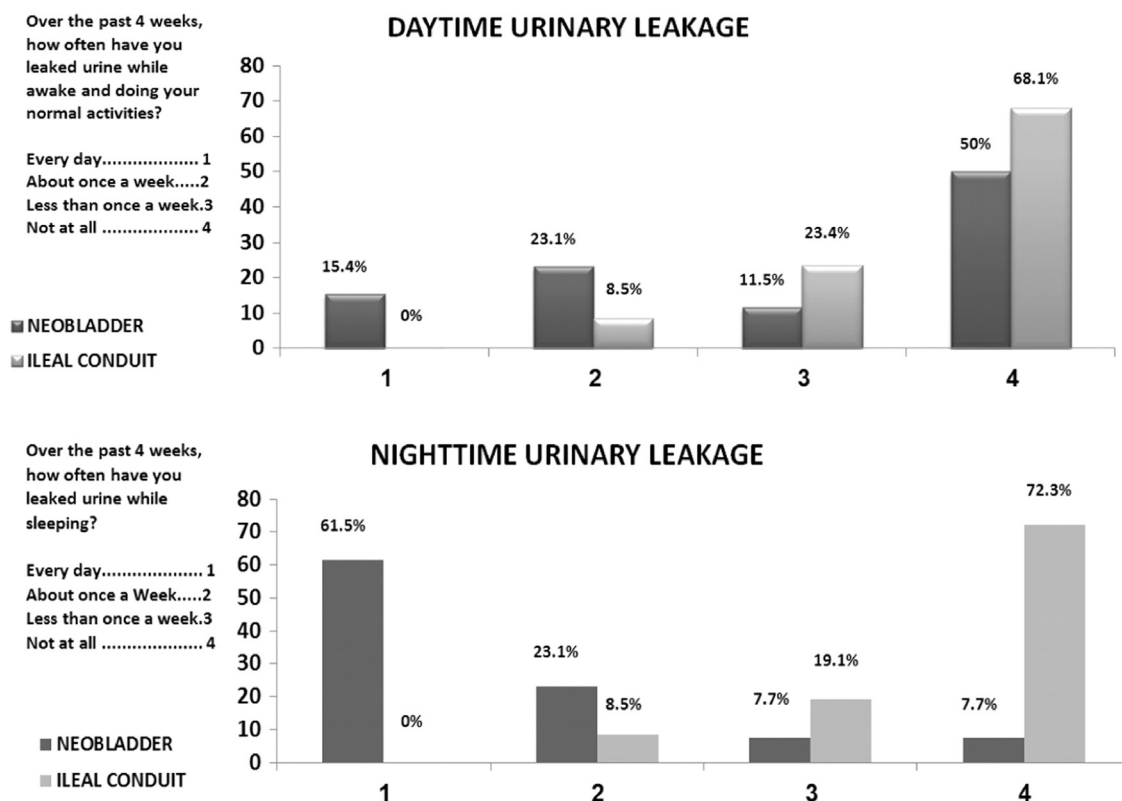


Fig. 1. Daytime and nighttime urinary leakage in neobladder and ileal conduit groups ( $P < 0.01$ ).

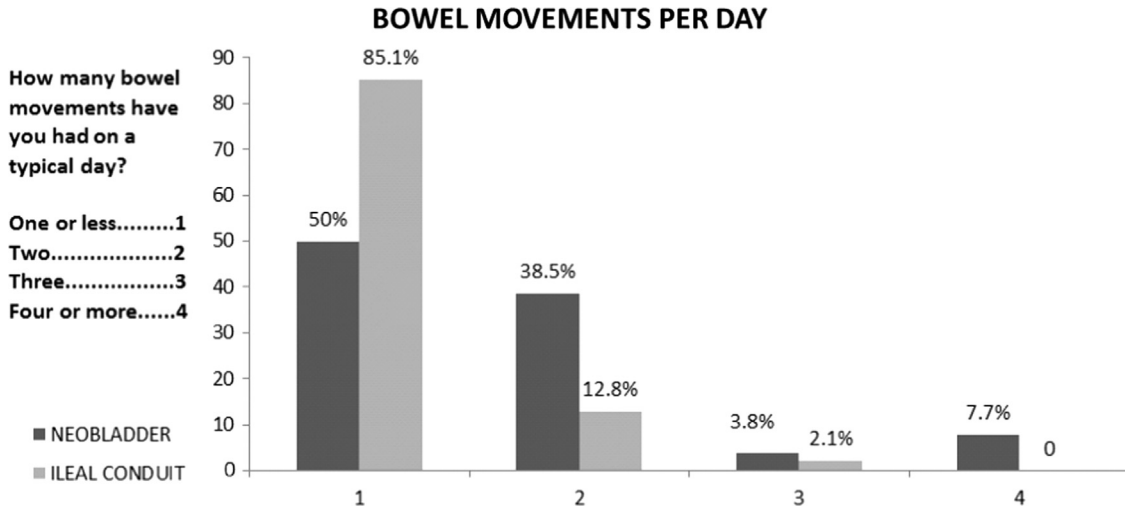
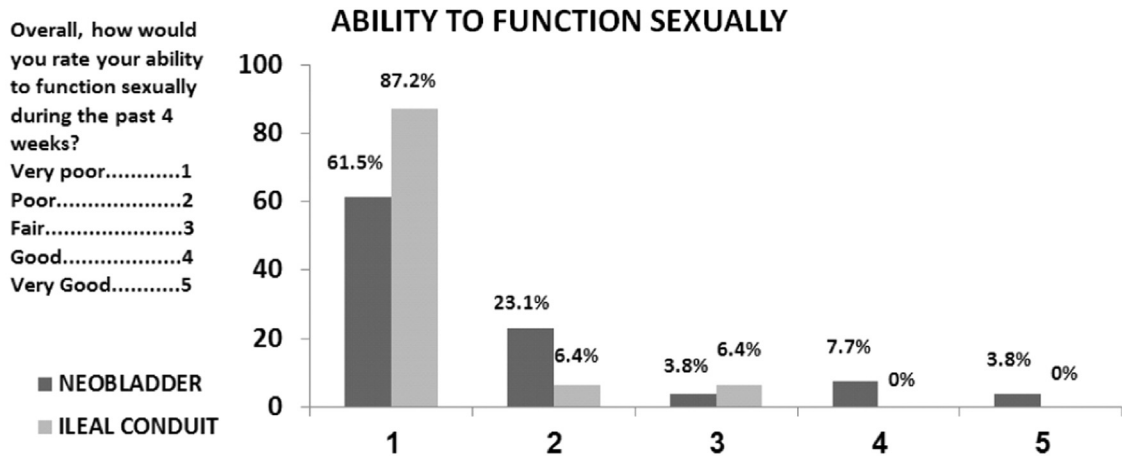


Fig. 2. Bowel movement during the day in neobladder and ileal conduits groups ( $P < 0.01$ ).

( $p=0.03$ )



( $p<0.01$ )

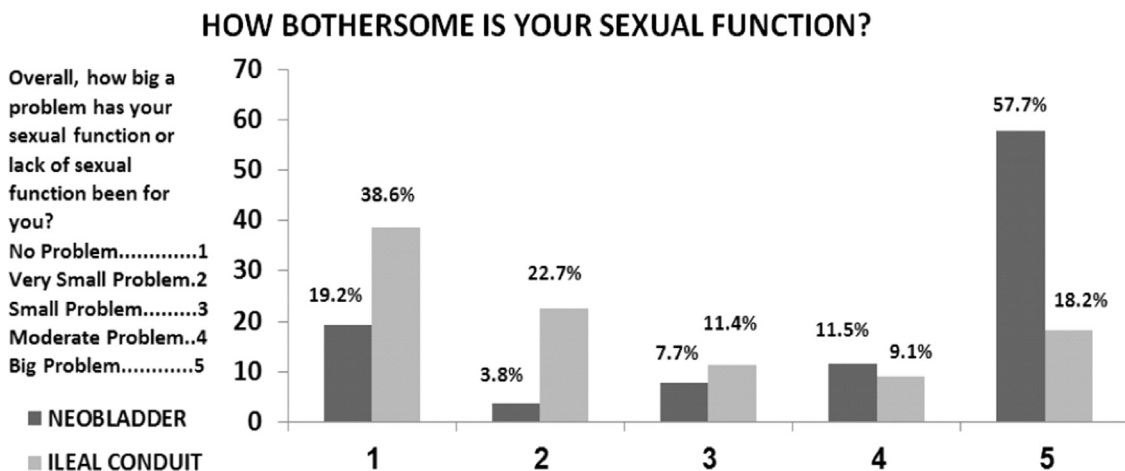


Fig. 3. Sexual functionality and level of bother owing to lack of function in neobladder and ileal conduit groups ( $P = 0.03$ ) and ( $P < 0.01$ ).

and sicker patients who were generally offered ICD. Unexpectedly, however, the urinary function scores were significantly lower in the ONR group compared with the ICD group. Together with the findings of Gilbert et al. [8,9], who reported on comparable outcomes, the commonly held belief that continent UD may offer a better HRQoL compared with a noncontinent UD requires critical scrutiny. Most patients anticipate that a continent diversion, preserving the normal urinary function and body image, is associated with a higher overall HRQoL. There is only very limited empirical evidence to support this [3,10–12]. Choosing ICD as the preferred form of UD may seem counterintuitive because of fear of urine leakage, skin irritation, and altered body image. However, urinary incontinence in patients with ONR, whether daytime, nighttime, or both, may also contribute significantly to a low urine function score associated with impaired HRQoL. Irrespective of the actual urinary function, the similar bother scores and lack of regret observed in both groups suggest that patients may adapt to any functional impairment over time. This premise is supported by prior studies demonstrating no difference in the ultimate HRQoL among patients undergoing ICD, continent cutaneous diversion, and ONR [5,10,12–15].

Although the bowel domain scores (function and bother) were almost identical between both groups, it is important to highlight the more commonly observed constipation among patients with ICD. Although the latter finding is likely an age-related issue regardless of the form of UD, it should be included in the preoperative counseling of every patient, particularly those scheduled to undergo ICD.

Significant variation in the sexual subdomains was detected among the groups. Although patients in both groups reported on overall low sexual function, those undergoing ONR had much higher scores than their counterparts undergoing ICD, translating into better sexual function. The bother scores in the ONR group, however, were substantially lower, indicating that the impairment in sexual function affected these patients more considerably. *Although patients undergoing ONR are younger, healthier, and more likely to be concerned with their sexual function, as they grow older their worsening sexual function appears to bother them much less.* This again reinforces the concept that patients adapt to their UD over time and are less likely to be bothered by their problems.

The effect of disease relapse on HRQoL remains elusive. The 5 patients with recurrence included in our study (3 with ONR and 2 with ICD) had BCI domain scores that were similar to those of their cured counterparts. This finding, albeit highly limited by the small number of affected patients, suggests that cancer relapse is not expected to alter the overall quality of life, irrespective of the type of UD patients ultimately elect.

Our study has several limitations. First, its inherent selection bias is unavoidable. Expectedly, patients in both groups differed in age and general health status, which

constitutes a drawback in any similar retrospective comparison. *Second, the overall low response rate of 47% suggests a highly selected group of patients with conceivable better HRQoL outcomes compared with patients who could not be reached. Although the latter patients had a similar age and age-adjusted Charlson comorbidity scores compared with their recruited counterparts, they also presented with a much worse disease (data not shown), which explains why almost 40% (42/ 108) had eventually succumbed to their disease.* Third, although a minimum interval of 1 year was required between the surgery and interview, and the average time to accrual was similar in both groups, patients were enrolled at slightly different time points after their surgery. *With the understanding that functional alterations may occur even after 1 year (e.g., reduction in infection rates among patients with ONR [16]), the true effect of time elapsing since surgery on patients' adjustment to their UD remains unclear.* Fourth, only 7 women were included in our cohort. Hence, a separate sex-specific analysis could not be performed. The BCI tool, however, is considered a validated cross-sex questionnaire that overcomes the sex difference [9]. Fifth, 2 patients in the ICD group and 3 in the ONR group had disease recurrence during follow-up. Unfortunately, these numbers are too small to allow a meaningful assessment of the effect of cancer recurrence on HRQoL. *Lastly, future trials should also assess the baseline HRQoL status to allow meaningful analysis of the influence of the preoperative status on ultimate HRQoL outcomes.*

## 5. Conclusions

Although the choice of UD is ultimately based on individual biases and physician's experience, robust HRQoL data generated by validated tools are critical for patient counseling. With the understanding that satisfaction or regret is dependent mostly on preoperative expectations, establishing a more realistic perspective regarding long-term functional outcomes remains vital. Our study suggests that the high likelihood of bother resulting from daytime and nighttime urinary incontinence as well as risk of sexual dysfunction be highlighted to those choosing ONR, whereas patients electing ICD should be reassured that their expected HRQoL would not be compromised. *Any type of UD might be associated with detrimental ramifications concerning HRQoL; however, irrespective of their preference, patients eventually adapt and thus the likelihood of regret is extremely rare.*

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