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**Orthotopic diversion after cystectomy in women:
A single-centre experience with a 10-year follow-up**

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KEYWORDS

Female;
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ABBREVIATIONS

RC, radical cystectomy; US,
ultrasonography; CIC, clean
intermittent catheterization

Abstract Objective: To evaluate and update the clinical and surgical outcome of orthotopic diversion in an eligible cohort of women with bladder carcinoma.

Patients and methods: From 1999 to 2010, 78 women (mean age 42.4 years) had a radical cystectomy (RC) with orthotopic diversion using ileal neobladder reconstruction to treat invasive bladder carcinoma. The mean (SD) follow-up was 62 (25) months.

Results: The histopathological pattern was squamous cell carcinoma in 52 (67%) patients, transitional cell carcinoma in 17 (22%), mixed in four (5%) and undifferentiated carcinoma in five (6%). Three patients were completely incontinent day and night. Stress urinary incontinence after this surgery was reported in 11 (14%) patients, with daytime continence reported in 64 (82%); 59 (76%) patients were completely continent day and night. Chronic retention developed in nine (12%) patients. There was pouch prolapse through the vaginal stump in five (6%) patients, and a pouch-vaginal fistula in seven (9%). Sexual dysfunction was reported in 45 (69%) patients of 65 sexually active women. Stones formed in the pouch in five (6%) patients, while there were renal stones in four renal units. Oncological recurrence was reported in 15 (19%) patients, which was local in 11 (14%) and distant in four (5%).

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Conclusion: The long-term results showed that orthotopic neobladder construction after RC in women provides oncological safety and is functionally effective with proper surgical technique. Removal of the gynaecological organs during RC in women might be unnecessary for low-grade, low-stage tumour.

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Introduction

Carcinoma of the urinary bladder is a major health problem in Egypt and the Middle East region. Radical cystectomy (RC) and orthotopic neobladder substitution are now highly desirable and strongly recommended for suitable surgical candidates, especially female patients, as removing the bladder neck and a small portion of the adjacent urethra will not compromise the oncological outcome [1]. In recent years the ileal orthotopic neobladder has gained increasing popularity as a form of urinary diversion in patients undergoing RC bladder cancer [2]. However, considerable surgical, urological, oncological and sexual risks are anticipated.

The aim of the present study was to evaluate and update clinical, surgical, functional and oncological outcomes of nerve-sparing RC with orthotopic diversion in an eligible cohort of women with bladder carcinoma, and with a long follow-up.

Patients and methods

Between January 1996 and July 2010, 1270 RCs with different forms of diversion were carried out at our institution in patients with bladder carcinoma. Of these patients, 320 were women, and orthotopic diversion with ileal neobladder reconstruction was performed for 78 of them throughout this period. We selected women with invasive bladder carcinoma, with no extravesical extension and no grossly enlarged pelvic lymph nodes, with no previous history of urinary incontinence, pelvic irradiation or colonic diseases, were considered suitable candidates. The mean (range) age was 42.4 (36–58) years. The preoperative assessment of renal function and upper urinary tract morphology included serum creatinine levels, ultrasonography (US) and excretory urography. Most of the patients were examined by CT of the abdomen and pelvis. The mean (SD, range) preoperative serum creatinine level was 0.95 (0.4, 0.7–1.5) mg/dL.

Surgical technique

Sixty-nine (88%) patients had a standard RC, with bilateral pelvic lymphadenectomy and hysterectomy according to standard procedures [3], with slight modifications. We used a transperitoneal approach for optimal access to the pelvic lymph nodes. In pre-menopausal women we left the ovaries in situ if they appeared to be normal. All lymph nodes at the boundaries of the ureters crossing the common iliac artery and vein (proximally), the genitofemoral nerve (laterally), and inguinal ligament (distally), the hypogastric vessels (posteriorly), including the obturator fossa, were dissected. The peritoneum was incised in the Douglas cavity just below the vaginal fundus. The vaginal wall was closed transversely with inverted running polyglactin 2–0 sutures.

To retain fertility, genital-sparing RC was used in nine (12%) of the patients, selected because they were relatively

young, wished to retain the capacity to become pregnant, and had tumours that were small, of low grade and stage, and situated away from the trigone, on the dorsal or lateral sides of the bladder wall. The peritoneum was incised in the utero-vesical pouch, the vagina left intact and dissection continued in the well-vascularized plane between the bladder floor and the anterior vaginal. We carefully dissected the lateral vaginal walls, bladder neck and proximal urethra to leave most of the plexus fibres to the urethra intact, thus preserving the sphincter mechanism. The dorsomedial pedicle was transected close to the bladder wall taking care to stay as close as possible to the proximal urethra, avoiding any dissection caudal to the level of urethral incision. The specimen was then detached ≈ 0.5 cm below the bladder neck. We kept the suspensory fascial ligaments of the remnant urethra intact. The urethra was then anastomosed end-to-end to the neobladder using six polyglactin 2–0 sutures. We used 40 cm (proximal to the distal 30 cm) of ileum to create a W-shaped ileal neobladder. We detubularized and orientated the ileal segment into a ‘W’ shape. The ureters were implanted using the serous-lined extramural tunnel technique [4,5]. We created a posterior support to the neobladder by an omentum flap put in the junction between the neobladder and the urethra. This flap was circumferentially sutured to the pelvic fascia and to the vaginal wall just below the ventral urethral margin, with polyglactin 2–0 sutures. Moreover, the pouch was fixed anteriorly to the pubis or to the Cooper ligament and laterally to the endopelvic fascia.

All patients were followed at 3-month intervals in the first year after surgery, at 6-month intervals during the second year, and annually thereafter. The mean (SD, range) follow-up was 62 (25, 36–112) months. The follow-up assessment included an interview about daytime continence, stress incontinence, nighttime continence, voiding frequency and micturition difficulties. Patients had a physical examination and blood chemistry assessed at each visit. The upper tract was monitored by US, with excretory urography if needed. All patients had ascending and postvoid studies at 6–12 months after surgery.

The capacity (volume) of the pouch and postvoid residual urine volume were assessed by abdominal US. Urine samples

Table 1 The histopathological pattern of the surgical specimen, and pathological stage.

Histopathological type	n (%)
Squamous cell carcinoma	52 (66)
Transitional carcinoma	17 (21)
Mixed tumour	4 (0.5)
Undifferentiated	5 (0.6)
Pathological stage	
P3b	54 (58)
P3a	31 (39)
P4	2 (3)

Table 2 Site of oncological recurrence.

Site	n (%)	Years to recurrence
Urethral	1 (1)	1
Local pelvis	10 (13)	2.5-5 outside the pouch
Bone	3 (4)	Variable
Lung	1 (1)	3

were cultured and pathogen sensitivity was determined in all patients. A bone scan, CT and chest X-ray were used if clinically or radiologically indicated. In all, seven (8%) patients died during the follow-up, five (6%) from bladder carcinoma and two (3%) of causes unrelated to bladder tumour.

Results

All patients included had two kidneys, and thus two uretero-intestinal anastomoses were made. There were no deaths soon after surgery. The histopathological pattern of the surgical specimen is shown in Table 1. Oncological recurrence was reported in 15 (19%) patients, being local in 11 (14%) and distant in four (5%); Table 2 shows the site of oncological recurrence.

For the functional outcome, the continence rate and voiding patterns are summarized in Table 3. There was pouch prolapse through the vaginal stump in five (6%) patients in whom colposuspension and anterior fixation of the pouch, to the pubis or to the Cooper ligament, were not attempted during RC. All of these women had chronic retention and were treated by clean intermittent catheterisation (CIC).

Sexual dysfunction was reported in 45 (69%) patients of the 65 sexually active women; there was diminished ability or inability to achieve orgasm in 15 (23%), decreased sexual desire in 13 (20%), diminished lubrication in 10 (15%), and dyspareunia was reported in seven (11%) patients.

Urinary cultures were positive in five (6%) patients; such patients were usually diabetic and had chronic retention or a large residual urine volume. They were treated with antibiotics and CIC.

There was renal deterioration apparent on US, as severe parenchymal atrophy in three renal units in three patients (4%), with chronic pyelonephritis in five renal units in five (6%) diagnosed by US and confirmed with DMSA scintigraphy.

The reported complications are shown in Table 4. Stones formed in the pouch in five (6%) patients, and were treated by open surgery, while there were renal stones in two patients (3%, three renal units); two of them were treated with ESWL and the other by percutaneous nephrolithotomy.

Uretero-ileal strictures developed in four patients (5%), diagnosed by US and IVU, two in the first year and the other two in the second year after surgery. We repaired the stricture

Table 3 Voiding characteristics in the patients.

Voiding pattern	n (%)
Chronic retention	9 (12)
Stress incontinence	11 (14)
Daytime continence	64 (82)
Night-time continence	59 (75)
Total incontinence	3 (4)

Table 4 The reported complications.

Complication	n (%)
Renal deterioration	3 (4)
Uretero-ileal stricture	4 (5)
Poucho-vaginal fistula	7 (9)
Chronic retention	9 (11)
Stones	9 (11)
Total incontinence	3 (4)
Sexual dysfunction	45 (57)
Chronic pyelonephritis	5 (6)
Oncological recurrence	15 (19)
Incisional hernia	3 (4)

successfully using open surgical techniques; we did not try endoscopic treatment as it is difficult and has a high failure rate. All four renal units improved during the follow-up.

An incisional hernia was reported in three patients (4%) and was managed by surgical repair with mesh insertion. A poucho-vaginal fistula occurred in seven patients (11%) and all of them were diagnosed in the first 3 months after surgery. Four (5%) were repaired through a transvaginal approach using a Martius pedicled flap. Three repairs were successful and one recurred, the last patient being offered a cutaneous diversion. The other three patients were repaired through a transabdominal approach, as the fistula was high at the site of the vaginal vault, and an interposition of a pedicled omental flap was used.

In the fertility and genital-sparing group (nine patients, 11%), there was night-time incontinence in only one, while the other eight were continent day and night. Only three patients had sexual dysfunction. Two patients gave birth by Caesarean section, but they had some difficulties in emptying their pouch and were advised to use CIC when needed. None of this group had oncological failure during their follow-up.

Discussion

It has been clear that over the last decades RC is considered the standard management for muscle-invasive carcinoma of the urinary bladder, with the highest survival and lowest recurrence rates [6]. The most important question in orthotopic diversion is the risk of a second primary tumour in the remaining urethra. However, Chang et al. [7] reported that only three women (7.5%) in whom intact gynaecological organs were removed at RC had malignancy within the gynaecological organ. Also Bedeir et al. [8], in a study that included 145 patients who underwent orthotopic substitution, reported no incidences of genital involvement in RC specimens. The idea that female patients are at greater risk of harbouring a second primary tumour, and that the urethra should be an integral part of cystectomy, was argued by Stein et al. [9], who reported a low urethral recurrence rate of 2% in a series of 841 women followed for > 20 years. In our series, the local recurrence rate in all 78 patients was 14%, with 1.2% urethral recurrence, and distant metastasis was reported in only 5%. The primary tumour in all cases was away from native urethra. Thus we think that there is an acceptable low risk of urethral recurrence, and it should not influence the decision about the type of diversion.

Sexual activity is considered a very important social issue and affects quality of life, especially among the younger group. In our series the mean age was 42 years. Sexual activity

depends on the integrity of autonomic nerves. Various studies on sexual function after RC and orthotopic diversion showed a deterioration in sexual function in nearly half the patients [10,11]. The most frequent complaint was inability to achieve orgasm, loss of lubrication and dyspareunia. In our series, sexual dysfunction was reported in 45 (69%) patients of 65 sexually active women, with diminished ability or inability to achieve orgasm in 15 (23%), decreased sexual desire in 13 (20%), diminished lubrication in 10 (15%), and dyspareunia reported in seven (11%). Moreover, the uterus was spared in nine (11%) patients, with strict selection criteria (small low-grade and low-stage tumour, relatively young, with normal menstrual cycle and healthy internal genitalia, and wishing to preserve their fertility for social purposes). Two patients became pregnant and had given birth to healthy babies by Caesarean section at 2 years after RC.

The urethral length needed for continence in females is the distal two-third, containing the striated sphincter, which is innervated by branches of the pudendal nerve, as well as the remaining smooth muscle [12]. The endopelvic fascia must be kept intact and dissection distal to bladder neck minimised, to prevent injury to the rhabdosphincter region. In addition, the pubo-urethral suspensory ligaments must be left intact. It has been suggested that autonomic nerves from pelvic hypogastric plexus might contribute to continence after RC. Thus we minimised dissection in the region of the common iliac arteries (the site of crossing of hypogastric nerve).

All patients voided through the native urethra by abdominal straining after feeling abdominal fullness, or every 3–5 h. In the present patients the continence rate was 75% at night, with 82% completely continent during the day, but 14% with stress urinary incontinence and 3.8% with total incontinence. In other series, the daytime continence was reported as 74–99% [13,14]. We think this wide range is due to many factors, e.g. preoperative data of the patient, previous surgery, radiation, and surgical technique used.

We used 40 cm of ileal segment to reconfigure the W-neobladder, although we made a posterior support with an omental flap, and used a nerve-sparing technique; we still encountered chronic retention or hypercontinence in 12% of our patients. In other series the rate was reported to be 20–70% [15,16]. Others reported only 16% with chronic retention in females with orthotopic diversion, although they omitted to preserve the hypogastric plexus [17]. Our low incidence of chronic retention might be a result of our efforts to preserve as much as possible of the autonomic innervation in the fascia surrounding the bladder neck and proximal urethra.

Poucho-vaginal fistula is a major surgical problem after surgery, with an incidence of 3–5% in several large series [18,19]. Inadvertent injury to the anterior vaginal wall was attributed as the cause of this problem (especially during dissection in the region of bladder neck and proximal urethra, or during transection of the urethra). Some authors advocate vaginal-sparing RC to minimize this complication [20]. In our series none of the nine patients who had a fertility- and genital-sparing RC developed a poucho-vaginal fistula. Moreover, eight of them had day and night continence and none developed chronic retention.

Urine cultures from our patients with orthotopic bladder pouches were usually sterile and generally we do not use prophylactic antibiotics, especially in continent patients who regularly

empty their pouches and have no significant residual urine. However, there was significant bacteriuria during the follow-up in five patients (6%). Those patients usually were diabetic and had chronic retention or large residual urine volumes. Other authors reported a significantly greater risk of bacteriuria of $\approx 50\%$, and half of those patients will develop a UTI [21].

In a prospective study in which 74 patients were treated with refluxing orthotopic diversion, and were followed for long periods (mean 88 months), only 1% of their renal units developed loss of cortical thickness [22]. In the present series renal deterioration was reported in only three patients.

Another surgical challenge facing the urologist is the uretero-intestinal stricture. The reported incidence of this complication is 0.6–9.3% [23,24]. In the present series the incidence was as low as 0.5%, which might be due to the non-refluxing uretero-ileal anastomosis we used in these patients.

In conclusion, with proper selection, patient education, good surgical techniques, and special attention to the continence mechanism and surgical anatomy, as well as a careful follow-up, a good functional and oncological outcome can be achieved, with an acceptable quality of life in these patients. Removal of gynaecological organs during RC in women might be unnecessary in those with low-grade, low-stage tumours. The use of nerve-sparing procedures might improve the functional results in terms of continence and sexual function, as long as basic oncological principles are maintained.

Conflict of Interest

The authors have no conflict of interest to declare.

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