Orthotopic ileal W-shaped neobladder: functional results and oncological outcome

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INTRODUCTION: There still exists an ongoing debate regarding the optimal method of ureterointestinal reimplantation in continent urinary diversion. The main objectives of the present study was to analyze the long-term functional results and the oncological outcome after the construction of orthotopic ileal neobladders, based on the antireflux serous-lined extramural tunnel technique.

MATERIAL AND METHODS: A total of 32 bladder cancer patients (30 males and 2 females, mean age 58 years), who underwent between 1/9/1996 and 1/9/2006 extended pelvic lymphadenectomy and radical cystectomy, followed by the construction of orthotopic W-shaped ileal neobladder, entered the study. All ureters were reimplanted via serous-lined extramural tunnels for reflux prevention. Adjuvant systemic chemotherapy with gemcitabine plus cisplatin was applied in 17 cases. All patients were evaluable for follow up (mean follow up – 53.938 months). Evaluation included clinical, radiographic and urodynamical studies to determine functional and oncological outcomes. RESULTS: None of the patients died in the hospital. Various early and late complications occurred in 18.8% and 21.9% of the patients, respectively. The overall incidence of day- and nighttime continence was 93.8% and 78.1%. Stenosis at the anastomotic site occurred in 2 ureteroileal anastomoses (3.2%), while none of the patients showed evidence of pouchnoureteral reflux. Renal function was stabilized or improved in 96.8% of the reimplanted renal units. Eight oncological failures were observed during follow-up: 1 local tumor recurrence and 7 metastatic tumor spreads. The overall and disease-specific patient survival was 72% and 81%, resp.

CONCLUSION: The serous-lined extramural tunnel technique provides an effective and safe ureterointestinal anastomosis, achieving nonobstructed unidirectional flow of urine. The results are durable and sustained with time. Therefore, this technique should be recommended whenever a construction of a continent intestinal urinary reservoir is considered.

Key words: orthotopic ileal neobladder, reimplantation, ureter, serous-lined tunnel

INTRODUCTION

There is a general consensus currently achieved that the construction of an orthotopic ileal neobladder is the diversion method of choice after total cystectomy1,2. In spite of the prolonged operative time and the sophisticated surgical technique, this operation has comparatively low (less than 2%) perioperative mortality and acceptable morbidity. The improved anesthesiological techniques, the availability of wide-spectrum antibiotics, the better understanding of the balance of the liquids and electrolytes, and the prophylactic use of anticoagulants increased to a great extent the popularity of this surgical method.

Many techniques for the construction of an orthotopic neobladder have been already offered and successfully used in practice7,8,9,10. They are almost comparable with regard to the functional results achieved. There still exists, however, an ongoing debate regarding the optimal method of ureterointestinal reimplantation in continent urinary diversion.

The main objectives of the present study was to analyze the long-term functional results and the oncological outcome after the construction of orthotopic ileal neobladders, based on the antireflux serous-lined extramural tunnel technique.

MATERIAL AND METHODS

The method was first introduced in Bulgaria in September 1996, but more frequently used in the last 5 years. Till September 2006, it was applied in our clinic in a total of 32 patients (30 males and 2 females), aged between 39 and 71 years (mean age 58 years).
Invasive bladder cancer (stage pT2-pT4) was the main indication for extended pelvic lymphadenectomy and one-stage radical cystectomy in all patients. Tumor invasion into the prostatic urethra (in males) or the bladder neck and/or the anterior vaginal wall (in females) was considered as contraindication for this type of urinary diversion.

The preoperative patient preparation was similar to that of any prolonged surgical procedure. Special attention was paid to the patient liver and renal function. Creatinine clearance below 50 ml/min was considered as a contraindication for the construction of an orthotopic ileal neobladder.

Bowel preparation included 2-day fasting (liquid diet only) and enemas on the night before surgery. Antibiotic prophylaxis was not mandatory.

The formation of an orthotopic ileal W-shaped neobladder is described in details elsewhere. Briefly, the basic steps of the surgical procedure are presented on Fig. 1.

The ureteral tubes were removed between the 7th and 10th day after surgery, while the urethral catheter was maintained for 3 weeks.

Adjuvant chemotherapy was applied in a total of 17 patients. The protocol included cisplatin on day 1, at a dose of 75 mg/m2, and gemcitabine on day 1 + 8, at a dose of 1.6 mg/m2.

In five of these cases, the preoperative image studies (US, CT, MRI) showed bulky lymph node metastases (N1-3) and/or local extension of the tumor to the adjacent pelvic organs (cT3b-T4). These 5 patients received neoadjuvant chemotherapy prior to surgery, applied at 2 weeks intervals, a total of 2 – 4 cycles.

Beside these 5 cases, the same chemotherapy regimen was further continued after surgery to a total of 6 – 8 cycles in 12 patients with unfavorable pathological parameters – advanced local stage (= pT3b) with positive surgical margins, and/or metastatic lymph nodes (pN1-2).

After discharge from the hospital, the patients were followed each month during the first 6 months, and every 3 months thereafter. The check-up examinations at follow-up comprised the routine clinical, laboratory, ultrasound, and X-ray image studies, and were done at regular intervals after surgery.

Microbiological studies of the urine were performed in all patients with urinary tract symptoms, and in those with proven reflux and/or pathological aberration of the upper urinary tract. IVP was performed at the 6th and 12th month after surgery, and each 2 years thereafter. Retrograde pouchography with consecutive urodynamic and ultrasound studies used to assess the efficacy of the antireflux mechanism, the capacity of the ileal neobladder and the quantity of the residual urine, was performed at least once during the 1st year after surgery, and each 2 years thereafter. If local recurrence or distant metastases were clinically suspected, additional investigation, including CT, MRI, and bone scintigraphy was done.

The follow-up period varied between 8 and 125 months (mean 53.9  38 months).

**RESULTS**

Most patients tolerated the surgical procedure quite well. There was no perioperative mortality. Various early complications occurred during the hospitalization period, however, in six of the cases (18.8% of all patients). The most commonly met early complication in our series was the prolonged ileus, which led to evisceration and urgent
surgical exploration in one of the cases. To prevent such life-threatening complications, recently we started to use routinely in our practice the metallic laparosynthesis (Fig. 2). Satisfied with the results, we now widely advocate it to any patient, subjected to such major abdominal surgery. Reservoir’s rupture due to haemorrhage and bladder haemotamponade occurred in one patient, which also required surgical exploration. Prolonged urinary leakage occurred in another one of our cases, but we succeeded to manage it conservatively. Prolonged wound healing, due to bacterial infection, required secondary suture of the surgical wound in 1 of the cases.

Late complications were observed in seven patients (21.9% of all cases). Multiple urinary stones, formed around unresolved polyglactin sutures left in the pouch, were discovered in 1 patient and were removed by open surgery 3 years after cystectomy. Acute urine retention, due to mucus formation within the pouch occurred in one patient. In this case, a urethral stricture at the anastomotic site was found and successfully treated endoscopically. A large postoperative hernia in another patient required reconstructive surgery of the anterior abdominal wall by placement of an artificial polyamide cloth sheet.

There were no significant metabolic derangements in our patient series. All patients were advised, however, to take postoperatively 8-10 g sodium bicarbonate a day, to prevent the occurrence of hyperchloremic metabolic acidosis.

Urine cultures were investigated in regular intervals after surgery. Significant bacteriuria ($10^5$) was established postoperatively in 11 patients (34.3%). The incidence of the bacterial strains was as follows: E. coli /36%/; Klebsiella /18%/; Proteus / 9%/; Pseudomonas /9%/; and other strains /27%/.

All patients with positive urine cultures were treated by proper antibiotics. Recurrent episodes of pyelonephritis were recorded in two cases only, both of which were treated conservatively, but required patient hospitalization.

Poucho-ureteral reflux was not observed in any of the cases, and that was convincingly proven by the follow-up retrograde pouchographies, which were mandatory performed after surgery (Fig. 3).

Deterioration of the renal function was observed in one patient only (2 renal units). It was due to bilateral ureteroileal stenosis at the anastomosis site, which led to pronounced hydronephrosis and renal impairment, and required conversion to ileum conduit by Wallace technique 2 years after the primary cystectomy.

Thus, the upper urinary tracts remained unchanged or improved in 61/63 (96.8%) of the renal units.

Currently, 23 of the patients included in our series (71.9%) are healthy and free of disease, without any signs indicating local recurrence or metastases.
At follow up, the disease progressed in eight patients (25%). One patient developed local recurrence at the anastomotic site with the urethra, which required total excision of the urethra and the pouch, and conversion to ileum conduit. Other seven patients developed distant metastases, in spite of the adjuvant systemic chemotherapy, which they received. Six of these patients later died of the disease. Three patients died of other concomitant diseases. Thus, the overall and disease-specific patient survival in the whole patient series is 71.9% and 81.2%, resp.

**DISCUSSION**

Almost all segments of the gastrointestinal tract have been used with various success as substitutes of the removed bladder after total cystectomy, the only exceptions being the esophagus and the duodenum. There is no doubt, however, that ileum is currently the most commonly used intestinal segment in urological reconstructive surgery.

The creation of ureterointestinal anastomosis is a key step in the reconstruction of any continent intestinal reservoir. Many experimental and clinical data show that, in order to avoid deterioration of the renal function, a well-performed anastomosis should be unidirectional (antireflux) and non-obstructive

A few surgical techniques for construction of orthotopic neobladders protect the upper urinary tracts from urinary reflux. The Le Duc technique is simple, but it leads to a higher rate of complications (20-30%), mainly due to the fact that the ureters remain exposed to the harmful influence of the urine, which results in fibrosis and stenosis at the anastomosis site.

Studer et al. suggested the use of a long afferent intestinal segment, to prevent the urinary reflux. The functional results reported in literature were favorable and sustained with time. However, to create an effective antireflux mechanism, the afferent intestinal segment should be at least 20 cm long, which carries the risk of consecutive metabolic derangements. Good results might be expected only if the urine remains sterile, if the ureters have good peristalsis, and if the pouch is emptying fully, and at a low pressure. Distal obstruction and/or hypercontinence may compromise the functional results of this antireflux technique.

The ileal orthotopic neobladder, suggested by Kock has a low rate of postoperative stenosis at the anastomotic site – less than 4%, due to the direct mucosa to mucosa anastomosis between the ureter and the intestine. On the other side, however, the incidence of complications, due to the construction of antireflux valve mechanism, is unacceptably high. The most common complications, described in literature, are desinvagination, valve stenosis and urinary stones, formed around the metal clips used at the operation.

Abol-Enein and Ghoneim first applied the serous-lined extramural tunnel technique to ileal neobladders, with the aim to prevent both reflux and stenosis at the site of ureterointestinal anastomosis. The results of this technique, reported by its authors, as well as by others, show low rate of complications, which does not exceed that of other compatible techniques of urinary diversion.

We also applied Abol-Enein and Ghoneim’s technique in our clinic and were satisfied with the functional results achieved. The technique efficiently prevents urinary reflux, and is associated with an acceptably low (3.2%) risk of stenosis at the anastomosis site. Besides, these results are durable and sustained with time.

We believe that the technique of orthotopic W-shaped ileal neobladder, based on the serous-lined extramural tunnel technique of ureteral reimplantation has distinct advantages, compared to other techniques of urinary diversion:

1. The length of the ileal segment used for reconstruction of the neobladder does not exceed 40 cm. This short length allows, however, an adequate storage capacity (reaching up to 500cc 6 months after surgery) to be achieved, meanwhile reducing to a great extent the rate of metabolic complications.
2. Surgery can be performed without any artificial materials, which avoids all related complications.
3. The direct mucosa to mucosa ureteroileal anastomosis reduces the rate of anastomotic strictures below 4%. This result is fully comparable, or even better than other techniques, using a direct mucosa to mucosa anastomosis.
4. Urinary reflux is practically avoided, and that is convincingly proved by the retrograde pouchographies performed after the reconstruction.

**FIGURE 4**

**POSTOPERATIVE INTRavenous PYELOGRAPHY, DEMONSTRATING WELL CONFIGURED AND NONOBSTRUCTED UPPER URINARY TRACTS.**

We believe that the technique of orthotopic W-shaped ileal neobladder: functional ACI Vol. LIV results and oncological outcome
5. The method might be applied to ureters of various caliber. The surgeon can easily chose and tailor the breadth and the length of the tunnel, adapting it to each individual case.

6. The urodynamic characteristics of the W-shaped ileal neobladder, which acts as a low pressure urinary reservoir with a big storage capacity, reduce to the minimum the postoperative incontinence rate.

7. The ureters, reimplanted by Abol-Enein and Ghoneim’s technique, allow the performance of various endoscopic procedures, including ureterorenoscopy. The ureteral ostiums can easily be discovered, which is much more difficult with other techniques of ureteral reimplantation.

8. Finally, the technique is versatile and easily reproducible by others.

CONCLUSION

The serious-lined extramural tunnel technique provides an effective and safe ureterointestinal anastomosis, achieving nonobstructed unidirectional flow of urine with minimal use of intestinal segment and without the use of artificial materials. The achieved functional results are durable and sustained with time. Therefore, this technique should be recommended whenever a construction of a continent urinary reservoir is considered.

SUMMARY

ORTOTOPSKA ILEALNA NEOVEZIKA W OBLIKA: FUNKCIONALNI REZULTATI I ONKOLŎKI ISHOD


