CASE REPORT

Lower urinary tract reconstruction following a cystectomy: experience and results in 20 patients using the "Studer" orthotopic ileal bladder substitution

Saidi S[1], Ivanovski O[1,3], Petrovski D[1], Kuzmanoski M[1], Stavridis S[1], Banev S[2], Popov Z[1]

Department of Surgery, Clinic of Urology, University Clinical Centre, Skopje, Macedonia.
o_ivanovski@yahoo.com

Abstract: *Introduction and objective:* To analyze the outcome, complications and functional results in patients undergoing bladder substitution with the Studer continent urinary pouch.
Materials and methods: At our Clinic, between January 2005 and December 2006, 20 male patients underwent a radical cystoprostatectomy followed by the Studer orthotopic bladder substitution.
Results: The transitional cell carcinoma was found to be the most frequent histopathological type. The distribution by grade and pathological stage showed all were high grade infiltrating tumors localized in the bladder. We observed 3 patients with neobladder-unrelated complications: one patient with a wound infection and 2 patients with a prolonged ileus.
Conclusion: In conclusion, our results with urinary diversion are promising in patients recquiring a radical cystoprostatectomy. We believe that the Studer•s orthotopic neobladder is an excellent alternative for patients suffering a radical cystectomy and offers a sufficient protection of the upper urinary tract with a low complication rate, good voiding function and continence *(Tab. 1, Ref. 25).* Full Text (Free, PDF) *www.bmj.sk.*
Key words: bladder cancer, orthotopic ileal bladder substitution, surgery.

Bladder cancer is the 11th most frequent tumor (1). In the US, >55.000 new cases are diagnosed every year and >10.000 deaths have been reported. It is the second most common malignancy in Europe. Bladder cancer incidence in the European Union accounts for 104.400 new cases per year with a ratio 4:1 for male. They represent 4.7 % of all tumors in men and 1.5 % in women (1). One third of the transitional cell carcinomas (TCC) of the bladder will be diagnosed as muscle invasive (2). Approximately 30 % of patients who are initially diagnosed with a superficial TCC will develop an invasive tumor during follow up after an organ-preserving therapy (2). Invasive and locally advanced bladder tumor is the urological malignancy with the highest mortality. Radical cystectomy is the gold standard treatment for muscle-invasive bladder cancer. Since Bardenheuer of Cologne performed the first cystectomy for bladder tumor in 1887, the surgical challenge has not been to remove the diseased organ, but rather to approximately replace its function. More than 100 years later the radical bladder extirpation remains the most effective local treatment for the invasive bladder cancer. The ileal conduit previously described by Bricker (3) has long been considered the gold standard for urinary diversion. Camey and Le Duc (4) reintroduced the concept of the neobladder in 1979. Since then many different methods of orthotopic bladder substitution have been used and all attempted to imitate the normal lower urinary tract function as closely as possible. The orthotopic substitution of the bladder following a cystectomy is currently well established. It provides the patient with a superior cosmetic appearance, and the potential for normal voiding function and continence. Despite these advantages, this type of diversion tends to be reserved for selected patients partly due to the perception that the greater technical complexity of orthotopic urinary diversion leads to greater perioperative and long-term morbidity. This procedure, which requires a bowel segment, avoids an abdominal stoma and may offer an improved quality of life for patients undergoing the radical cystectomy for bladder cancer (4). In 1989, Studer et al (5) described the low-pressure bladder substitution using a spherical reservoir consisting of four cross-folded ileal detubularized segments. This neobladder uses an afferent isoperistaltic ileal segment with direct ureteroileal anastomosis, which functions as an antireflux mechanism in order to protect the upper urinary tract. Since 1997, we have adopted the Studer ortotopic bladder substitution following a radical cystectomy in patients with an invasive bladder cancer. In the present study, we report the perioperative, early and late complications in 20 patients who underwent this procedure at our Clinic.

[1]Department of Surgery, Clinic of Urology, University Clinical Centre, Skopje, Macedonia, [2]Institute of Pathology, Medical Faculty, University Cyril and Methodius, Skopje, Macedonia, [3]SSP Stem Cell Unit, Kyushu University of Medical Sciences, Fukuoka, Japan

Address for correspondence: Ivanovski O, MD, PhD, Dept of Surgery, Clinic of Urology, University Clinical Centre, Vodnjanska 17, 1000 Skopje, Republic of Macedonia.
Phone: +389.70.387164, Fax: +389.2.3110368

Patients and methods

Between January 2005 and December 2006, 20 male patients underwent the radical cystoprostatectomy followed by an orthotopic bladder substitution, a technique previously described by Studer (5).

Bladder cancer was diagnosed by cystoscopic and bimanual examination plus a random biopsy. Preoperative staging involved a complete history and physical examination, complete laboratory tests, chest radiography, ultrasonography, excretory and computerized tomography of the abdomen and pelvis (for patients with a high grade and muscle invasive tumors). The indication for cystectomy was based on cystoscopic and biopsy findings, including tumor invasion of the muscularis propria without evidence of metastasis, high-grade, invasive tumors associated with carcinoma in situ (CIS), CIS refractory to intravesical chemotherapy or immunotherapy, recurrent multifocal superficial disease refractory to a repeated transurethral resection (papilomatosis) with/without intravesical therapy and tumors involving a bladder diverticulum. All patients showed an absence of tumor in prostatic urethra or bladder neck, confirmed by biopsy. All patients underwent the bilateral pelvic iliac lymphadenectomy with the en bloc radical cystectomy and urinary diversion. Of note, in our series we have performed the standard pelvic lymph node monoblock dissection that involves obturator packets and extends laterally to the external iliac and hypogastric vessels. The extend of dissection terminates at the bifurcation of the common iliac vessels. The distal resection of the cystoprostatectomy is as close to the apex of prostate as possible. Special attention was taken to evaluate the mental capacity of the patients to accept their new bladder and associated requirements.

All cystectomy specimens were pathologically examined according to the same protocol. Following cystectomy, patients were initially seen one month after surgery and then every 3 months for 1 year and every 6 months until a disease progression or death. Patients were followed by a complete physical examination, complete renal profile and blood picture, chest X-ray, CT abdomen and pelvis and isotopic bone scan whenever indicated.

We evaluated early post-operative and late complications. The mean follow-up period was 10 months (range 6–24 months). An upper tract study (excretory urogram or computerized tomography (CT)) was obtained at 3 months postoperatively to assess the surgical anatomy, and CT with intravenous contrast medium is performed every 6 months to assess the upper tracts and reservoir, and to search for recurrence. Complications were defined as perioperative if they occurred within 30 days after the operation and late if they occurred later.

The lower urinary tract function and urinary continence by post-void ultrasound of the reservoir was performed to assess the neobladder emptying at 1, 3, and 6 months. Urodynamic studies, including uroflowmetry, were performed only in continent patients. Continence was strictly assessed and rated as excellent if the patient was completely dry all times, good if there were occasional or sporadic episodes of leakage but no need for protection, fair if no more than a single pad was required in 24 h and unsatisfactory if more than 1 pad was required within 24 hours. The status of the upper urinary tract was assessed by radiological assessment using the intravenous pyeloureterography (IVP), and ther renal function with the metabolic status was also monitored by plasma urea nitrogen and creatinine with plasma chloride and arterial HCO_3.

Techniques

The technique of the ileal bladder substitution has been described by Studer et al (5, 6). Briefly, an ileal segment 55–60 cm in length was isolated 25 cm proximal to the ileocecal valve. The distal end of the ileal segment, 40–45 cm in length, was opened along its antimesenteric border. The construction of the reservoir was performed as previously described by Studer (5). Ureterointestinal anastomoses were performed in an open end-to-side fashion at the proximal part of the ileal segment. A hole with a diameter of 5 mm was cut out of the pouch wall and four 2-0 polyglycolic acid seromuscular sutures were placed between the hole in the reservoir and the edge of the membranous urethra and a 18F silicone urethral catheter was inserted defore tying the four sutures at 10, 2, 5 and 7 o'clock positions of the membranous urethra. Before the end of closing the neobladder, transmesenterialy cystostoma was introduced. On the 7th–8th postoperative day, the ureteric stents were removed. On 9th–10th postoperative day, the cystostoma was removed and after excluding fistula formation of the reservoir and leakage from the pouch-urethral anastomosis by "cystogram" on the 14th day, the urethral catheter was removed and the patients' were instructed how to void.

Postoperative care

The pouch is flushed with 20–40 cc normally every 4 hours and mucous clots are aspirated. After remowing the catheter patients are initially instructed to void while sitting, and to relax the pelvic floor and expel the urine by Valsalva's maneuver. The capacity of the neobladder gradually increases as the voiding interval is lengthened to 4 to 6 hours. Creatinine, bicarbonate and serum electrolytes are monitored postoperatively and every 3 months thereafter. Plasma vitamin B12 is measured at 1 month and anually.

Statistical analysis

Values are expressed as means plus or minus standard deviation (SD).

Results

General characteristics

All patients were males. The age at surgery ranged from 41 to 71 years with a mean age of 58 years. Mean operative time for cystectomy, lymphadenectomy and construction of the Studer neobladder was 6 hours 30 min (range 5 hour 20 min to 8 hours 35 min). The mean blood loss was 350 ml (range 100–750 ml), intraoperative transfusion 1 unit (ranger 0 to 3 units). Mean hospital stay was 27 days (from 20 to 72).

Histopathology

TCC was the most common tumor type diagnosed in 17 patients (85 %) followed by squamous cell carcinoma in 3 patients (15 %). The pathological tumor stage was pTa in one (5 %), T1 in one (5 %), T2a in two (10 %), T2b in one (5 %), T3a in 6 (30 %), T3b in 5 (25 %), and T4 in 4 (25 %) (Tab. 1). Tumor grade was 1, 2 and 3 in 1 patient (5 %), 1 patient (5 %) and 18 patients (90 %), respectively (Tab. 1). The lymph node involvement was N0, N1 and N2 and Nx in 15 (75 %), 1 (5 %), 3 (15 %), and 1 (5 %). Most of metastases were found in the fossa iliaca externa (87.5 %), fossa obturatoria (50 %) and fossa hypogastrica in 37.5 % of the cases. Regarding the location of tumor in the bladder, in patients with positive locoregional lymph nodes, 62.5 % of the tumors were located on the trigonum, 25 % in the bladder neck and 12.5 % laterally.

Perioperative complications

There was one perioperative death due to a damaged rectum. Perioperative complications related to the neobladder (leakage) were found in 6 patients (30 %). Four of them were conservatively treated with flushing. Two patients required a surgical revision after 21 and 30 days, respectively (10 %). The rest of the patients showed an absence of leakage on cystography performed before cateheter removing. We observed 3 patients with neobladder-unrelated complications: one patient (5 %) with a wound infection and 2 patients with a prolonged ileus (10 %).

Late complications and continence after 3 months

3 months after the surgery, daytime continence was achieved in 11 patients (65 %). Among them, excellent night-time conti-

Tab. 1. Pathological tumor stage, tumor grade and lymph node involvement in 20 patients who underwent radical cystectomy followed by Studer orthopic derivation.

T evaluation	No of patients	
Ta	1	(5 %)
T1	1	(5 %)
T2a	2	(10 %)
T2b	1	(5 %)
T3a	6	(30 %)
T3b	5	(25 %)
T4A	4	(20 %)
Grade		
G1	1	(5 %)
G2	1	(5 %)
G3	11	(55 %)
G3-4	7	(35 %)
Node involvement		
N0	15	(75 %)
N1	1	(5 %)
N2	3	(15 %)
Nx	1	(5 %)

nence was achieved in 8 patients. Late complications occurred in 3 patients (15 %). One patient required a urinary catheter after re-operation for leakage. After 3 months, 1 patient showed body mass loss, nausea, anorexia, with a persistent metabolic acidosis. He was catheterized and substituted with NaHCO3 per os as well as a reduction of acidic foods and beverages. One patient showed a complete retention.

Late complications and continence after 6 months

Day time continence was achieved in 14 patients (70 %). Excellent night-time continence was achieved in 9 patients (45 %). After one year, only one patient had a nocturnal incontinence requiring a single pad. One patient required a second operation (incision and TUR of uretroileal anastomosis 5.8 %). We did not observe any urethral recurrence in patients. One patient died of unknown medical problems 10 months after the operation. 15 monhts after the operation, one patient died due to recurrence of the disease in the retroperitoneal lymph node and deep flebothrombosis of the right leg.

Funtional outcome and continence

Urodynamic studies

All patients were able to void urine, first in a sitting position, and later in an upright position. Despite a small capacity in the early postoperative period, the capacity increased gradually with time, reaching almost 250 ml and over 400 ml at 6 months and 1 year after the surgery, respectively, and was maintained almost constatnt thereafter. There were 14 continent patients after 6 months. In continent patients we performed urodynamic studies. Residual urine was median 80 ml (range 30–220 ml). Capacity was median 420 ml (range 250–660 ml), MFR median 11 ml/sec (range 5–20 ml/sec). Average flow was 7 ml/sec (range 4–12 ml/sec). First sensation to void was at 300 ml (range 220–350 ml). Peak pressure (cm/water) was 26 (range 13–45).

Upper urinary tract status

From 11 patients, 3 had a dilatation of the upper urinary tract. Among them, 1 was with bilateral and 2 with unilateral dilatation of the upper urinary tract. All patients showed a left side dilatation. Two of them had a preoperative hydronephrosis. There was no relfux during voiding.

Discussion

During the last decade, the radical cystectomy with pelvic lymphadenectomy has been established as the standard for the treatment of invasive bladder cancer. It effectively removes the primary tumor and the regional lymph nodes that may contain metastases in about 25 % of patients undergoing this procedure (7, 8). However, even if muscle-invasive bladder cancer was shown to be organ confined before the radical cystectomy, up to one half of patients ultimately die of disease in spite of apparently complete surgical removal (9). This highlights the aggressive nature of this disease with an early metastatic spread, but

also the need for an early additional therapy in some patients to eliminate potential micrometastasis. According to the treatment EAU guidelines, patients with non-metastatic, operable, invasive bladder cancer are treated with radical cystectomy, pelvic lymphadenectomy and urinary diversion (10).

In the present study, we focused on the complication rate, functional outcome, continence rate and renal function in patients who underwent the radical cystectomy followed by the Studer orthotopic bladder substitution at our clinic. The early and late complications rates in our series were 30 and 15 %, respectively. These results are similar or only a bit higher compared with previously reported series, in which the perioperative complication rate ranged from 9 to 18 % and the late complication rate ranged from 6 to 24 %. Furthermore, there was no remarkable difference in types of complications between our cases and previously reported series (5, 6, 11). In addition, in our series, daytime continence was achieved in 70 % of the patients at six months following surgery which is similar with previously published reports (12, 13). The same was true for the night-time continence.

The main mechanism for the urinary control following the radical cystectomy with orthotopic bladder substitution seems to be the same as the one after the radical prostatectomy, which is preservation of the periurethral sphincter mechanism and muscles of the pelvic floor (14). However, Parekh et al (15) reported that patients with the bladder substitution achieve daytime control more rapidly than those undergoing radical prostatectomy, and stress urinary incontinence is rarely an issue. The intestinal neobladder has no detrusor sphincteric reflux that increases urethral closure pressure as bladder pressure increases (16). Also, unlike a normal bladder, there are no vesical sensory fibers allowing feedback to the brain to alert the patient when the reservoir is full, particularly at night (17).

The orthotopic neobladder after radical cystectomy offers a higher quality of life compared to an ileal conduit for patients who want to avoid an abdominal stoma (11, 18). The functional voiding outcome with a neobladder is excellent with high continence rates and generally good bladder emptying (6, 15). Despite these advantages, there is a general perception that creation of a neobladder is a technically complex and lengthy procedure associated with an increase in perioperative morbidity, complications and reoperative rates (19, 20). Elderly patients as well as high risk patients with significant medical co-morbidities are oftenly not offered a neobladder (21, 22).

The requirement for an ideal intestinal bladder substitution is low pressure, adequate capacity and high compliance, which provide continence and voluntary control of voiding without residual urine. It is obvious that these factors facilite a higher quality of life following the orthotopic bladder substitution. The Studes orthotopic ileal neobladder has the advantages of a satisfactory continence rate, absence of urinary leakage and freedom from intermittent catheterization (13). In addition, renal function is preserved, and intestinal malabsorption and fluid and electrolyte imbalance are avoided (3, 22). These features have rendered the Studer bladder substitution one of the most ideal orthotopic urinary diversions. Of note, the orthotopic bladder replacement

stimulates ealier cystectomy at the time when the potential for cure is highest. In addition, our experience with orthotopic bladder substitution shows that patients who are well motivated and carefully selected can achieve an outstanding outcome. For these patients life is similar to that with a native lower urinary tract. However, enthusiasm for orthotopic reconstruction should be tempered by an understanding of its indications and how not to contravene them.

Clinical staging of lymph node status in patients with muscle-invasive disease remains inaccurate. The finding of clinically occult disease can range from 15 % to 27 % with cross-sectional MRI and CT. We have previously reported 25 % of positive lymphonodes (pathohistologically confirmed) after cystectomy which is consistent with other series in the literature (25). In our series we found that in 62.5 % of the cases the tumor was located on the trigonum, 25 % in the bladder neck and 12.5 % laterally. Additionally, inferential data suggest the phenomena of skip metastases to higher-echelon nodes and crossing lymphatic drainage (23, 24). Current studies, in which endoscopic tracer instillation is used before cystectomy, reveal the absence of a sentinel node at the time of cystectomy in up to 20 % of cases, along with localization of sentinel nodes, when detected, beyond the obturator node region in one third of cases. This is clearly an area for further study that may yield clinically useful information.

In conclusion, we show that our results with urinary diversion are promising in patients requiring a radical cystoprostatectomy. We believe that the Studer's orthotopic neobladder is an excellent alternative for patients after a radical cystectomy and offers a sufficient protection of the upper urinary tract with a low complication rate, good voiding function and continence.

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