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Ileal orthotopic bladder replacement without stenting of the ureterointestinal anastomosis-10years observation

Abstract

Background: Stenting of ureterointestinal anastomosis is a standard precautionary measure, irrespective of the method of constructing the anastomosis; however no convincing scientific data exists to support this procedure.

Objective: Clinical assessment of patients-radical cystectomy and ileal orthotopic bladder replacement without requirement for stenting of the ureterointestinal anastomosis or suprapubic cystostomy.

Design, setting, and participants: To establish feasibility of ureterointestinal anastomosis without stenting. 426 radical cystectomies were performed between 1999 and 2009.

Intervention(s): Ileal orthotopic bladder replacement with afferent loop was performed in 124 patients.

Measurements: The following were evaluated: frequency of postoperative symptomatic urinary tract infections, duration of peritoneal drainage, length of hospitalization, duration of surgery, number of ureteral strictures type and number of major perioperative complications.

Results and limitations: Symptomatic pyelonephritis was observed in 10 patients (8%). The mean surgical time was 6.0hours (4.5-9.0). The mean time of peritoneal drainage was 9.1days (3-40). The mean time of hospitalization was 14.1days (7-40). Ureterointestinal anastomosis strictures were observed in 7 patients (5.6%). Major postoperative complications were observed in 12 patients (9.7%). Limitations: This is retrospective study without the control group.

Conclusions: Meticulous and a traumatic ureterointestinal anastomosis and efficient urine and mucus evacuation from the reservoir in our experience, removes the requirement for stenting of the ureterointestinal anastomosis.

Keywords: cystectomy, orthotopic bladder, bladder cancer, ureter, stents

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Introduction

Radical cystectomy is a standard procedure in invasive urinary bladder cancers and in superficial high-risk cancers. The ileal orthotopic bladder replacement is the most efficient way to reconstruct the urinary tract, both in women and in men.[1–4] Methods for orthotopic bladder construction described in literature recommend stenting of the ureterointestinal anastomosis as a standard precautionary procedure, irrespective of the method of constructing the anastomosis.[5–21] The rationale for stenting of the anastomosis includes protecting from the consequences of urine extravasation, and facilitating the fusion of intestinal and ureteral mucosa. Additionally, a tortuous ureter and oedema at the anastomotic site can lead to upper tract urinary stasis and both can be mitigated by preoperative stenting.

Furthermore, the evacuation of urine and retained mucus from the ileal reservoir is efficiently dealt with by the suprapubic cystostomy. Optimal duration of stenting remains a topic of much debate and suggestions from several author ranges from 7 to 14 postoperativedays.[5–21] The procedure of radical cystectomy with orthotopic bladder replacement carries a high risk of complications, mostly in the early postoperative period. According to the data available in the literature, the risk of early complications is 23-27%.[22–24] One of the most common complications is acute pyelonephritis, which is observed in 1.3-12.3% of patients.[25–27] Factors that predispose to the infection of the upper urinary tract are stents left *in-situ* and the necessity of regular and repeated flushing of the reservoir in the postoperative period.[28,29]

Urine leakage which does not require reoperation is observed in 0.3-6.6% of cases.[25,26] Ureterointestinal anastomosis stricture as a late complication is observed in 2.2-11.6% of patients.[26,30–34] The frequency of major complications, such as death, myocardial infarction, pulmonary embolism, septic shock, respiratory insufficiency or reoperation is 4.9-5%.[25,35] Improvements in operative techniques and

perioperative care have led to a reduction in the rates of complications post-radical cystectomy. Routine stenting of the ureterointestinal anastomosis has not been universally accepted and reports from transplantation cases have demonstrated higher risk of infection in comparison with the group of patients in whom stenting was not performed. According to some reports, stenting of the ureterointestinal anastomosis should be restricted to a selected group of patients.[36–38]

The number of studies on ureterointestinal anastomosis without stenting is limited, and their conclusions are ambiguous.[39,40] In our opinion, refraining from stenting of the ureterointestinal anastomosis lowers the risk of upper urinary tract infections, reduces both surgical time and hospital stay and improves postoperative recovery without exposure of the patient to any additional risk of complications. Clinical evaluation was performed on a group of patients in whom neither stenting of ureterointestinal anastomosis nor suprapubic cystostomy was performed.

Materials and methods

There were 426 cystectomies performed between June 1999 and December 2009 in the Department and Clinic of Urology in Wroclaw, Poland. In 124 patients, ileal orthotopic bladder replacement with afferent loop was performed. Stenting of the ureterointestinal anastomosis was not performed in any patient in the observed group. The detailed characteristics of the studied population, including age, sex, TNM staging and histological type of tumor are presented in Table 1.

The following were evaluated in the studied group:

i. Frequency of symptomatic urinary tract infections

ii. Time of maintaining the peritoneal drainage

iii. Incidence of the postoperative stricture of the ureterointestinal anastomosis

iv. Duration of surgery

v. Number ofdays of postoperative hospitalization

vi. Number of major complications in the postoperative period.

a. Acute pyelonephritis was diagnosed by the presence of fever above 380C in the postoperative period. Other potential causes of postoperative bacteraemia including pneumonia, peritonitis, wound infection, phlebitis and epididymitis were excluded. MSU was sent for culture in all patients with fever.

b. Peritoneal drains were removed when the amount of drained fluid did not exceed 50mL on two consecutive days. In cases that required peritoneal drainage for over 14days, the measurement of creatinine concentration in the fluid was performed to differentiate the presence of urine and lymph.

c. Ureterointestinal anastomosis stricture was diagnosed by intravenous pyelogram. The examination was performed only subsequent to demonstration of upper tract dilatation on an ultrasound performed with an empty intestinal orthotopic bladder.

d. Duration of the surgery was measured from the moment of the incision of the abdominal wall to its closure.

e. Time of hospitalization was measured in days, excluding the day of surgery.

f. Major postoperative complications included death, myocardial infarction, pulmonary embolism, septic shock, respiratory insufficiency and the need for early reoperation (up to 30days after cystectomy).

Table 1 Characteristics of the studied population

Total number of patients	**124**
Age [years]	
Median	60
Range	14-77
Number of Women (%)	10 (8)
Men (%)	114 (92.0)
Histological Grade	
G0 (%)	2 (1.6)
G1 (%)	5 (4.0)
G2 (%)	28 (22.6)
G3 (%)	84 (67.7)
Not evaluated	5 (4.0)
Histological type of tumor	
Urothelial carcinoma (%)	107 (86.3)
Anaplastic carcinoma (%)	3 (2.4)
Neuroendocrine carcinoma (%)	3 (2.4)
Planoepithelial carcinoma (%)	1 (0.8)
Urothelial + planoepithelial carcinoma (%)	5 (4.0)
Adenocarcinoma (%)	2 (1.6)
Angiogenic sarcoma (%)	1 (0.8)
Aggressive fibromatosis	1 (0.8)
Urinary bladder cirrhosis	1 (0.8)
Number of pts with tumor stage	
CIS (%)	6 (4.8)
T0 (%)	15 (12.0)
T1 (%)	17 (13.7)
T2a (%)	17 (13.7)
T2b (%)	25 (20.2)
T3a (%)	10 (8.0)
T3b (%)	18 (14.5)
T4 (%)	15 (12.0)
Tx (%)	1 (0.8)
Number of patients	
No regional lymph node involvement N0 (%)	103 (83.0)
Involvement of regional lymph nodes N+ (%)	20 (16.1)
Not evaluated (%)	1 (0.8)

Table continued...

Total number of patients	**124**
Number of patients	
No distant metastasis M0 (%)	122 (98.4)
Distant metastasis present M1 (%)	2 (1.6)
Number of patients	
Presence of preoperative hydronephrosis (%)	36 (29)
No preoperative hydronephrosis (%)	88 (71)
Time of observation (months)	
mean	24.7
range	0.25-68

Cystectomy with bilateral pelvic lymph node dissection was performed in all patients. Orthotopic bladder with afferent loop was created from the ileum. In all patients an S-shaped reservoir was formed. In all patients, the ureterointestinal anastomosis was created with end-to-side method with continuous monofilament 5.0 suture. Suprapubic cystostomy was not used in the observed group. Couvelaire catheter size Ch 22 with additional side apertures was left in the intestinal reservoir, allowing the drainage of urine and intestinal mucus.

In the postoperative period the greatest attention was paid to the hourly diuresis by noting down the urine volume every 2-3hours. Lack of urine or low urine volume with appropriate hydration of the patient was an indicator of a mucus or clot blockage in the catheter. A simple massage of the catheter was in these cases a sufficient maneuver to restore the urine flow. Patients did not require a routine flushing of the reservoir. The Couvelaire catheter was removed on the 21st day after surgery.

In all patients, peritoneal suction drainage with Redon drains was performed. Two drains were left in the area of the ureterointestinal anastomosis and one in the area of ureterointestinal anastomosis. In all patients, a similar antibiotic treatment plan was used- cephalosporin plus metronidazole for seven days after surgery. In every patient the urine culture was obtained before the surgery.

Results

a. Pyelonephritis was diagnosed in 10 patients (8%) (Table 2).

b. Symptoms of pyelonephritis were on average first observed on day 10 (range: 7-15) (Table 3).

c. Mean time of surgery was 6.0hours (4.5-9.0) (Table 4).

d. Mean duration of peritoneal drainage was 7days (range: 3-40) (Table 5).

e. Postoperative days of hospitalization averaged 12days (range: 7-40) (Table 6).

Major complications were observed in 12 patients (9.7%): 1 death on the 6th day after surgery due to pulmonary embolism, evisceration (1 pt), dehiscence of the intestinal anastomosis (3 pts), lymphorrhea requiring additional drainage (2 pts), urine leakage and the need for reoperation (2 pts), fistula between the intestinal reservoir and vagina in 2 patients (surgical correction), myocardial infarction (1 pt).

Table 2 Results of urinary culture in patients with symptoms of urinary tract infection

	Type of bacteria	**Number of patients**
Group	*Enterococcus fecalis*	9
	Sterile	1

Table 3 The beginning of infection after surgery

	n	**[days]**	**S [days]**	**Me [days]**	**X_{min} [days]**	**X_{max}[days]**
Group A	5	10	1.9	10	7	12

n, number; - mean; s, standard deviation; Me, median; x_{min}, minimal value; x_{max}, maximal value

Table 4 Duration of surgery

	n	**[h]**	**S[h]**	**Me[h]**	**x_{min} [h]**	**X_{max} [h]**
Group A	124	6	1.1	6	4.5	9

n, number; - mean; s, standard deviation; Me, median; x_{min}, minimal value; x_{max}, maximal value; h, hours

Table 5 Duration of peritoneal drainage

	N	**[d]**	**S[d]**	**Me[d]**	**X_{min} [d]**	**X_{max} [h]**
Group A	124	9.1	6.2	7	3	40

n, number; - mean; s, standard deviation; Me, median; x_{min}, minimal value; x_{max}, maximal value; d, days

Table 6 Duration of hospitalization after surgery (d-days)

	N	**[d]**	**S[d]**	**Me[d]**	**X_{min} [d]**	**X_{max} [h]**
Group A	122*	14.1	6.1	12	7	40

n, number; - mean; s, standard deviation; Me, median; x_{min}, minimal value; x_{max}, maximal value

Discussion

Ureteral stents are commonly used in everyday urology practice, although there use is not free of complications. The main purpose of stenting the ureterointestinal anastomosis is to mitigate the consequences of urine leakage and upper urinary tract urinary stasis both of which can be a consequence of kinking of the ureter or temporary edema at the level of the ureterointestinal anastomosis. On the basis of a number of clinical and experimental studies, it has been shown that maintaining the ureteral stents for more than 7days predisposes to a deleterious consequence, including epithelial metaplasia, incrustation of the ureteral mucosa, stone formation, and edema ulceration of the mucosa and development of moderate hydronephrosis.[41–43]

Stents left in the urinary tract in order to facilitate urine flow, may in the postoperative period paradoxically predispose t infectious complications. Reid's study demonstrated that the mechanism for this ascending urinary tract infection is facilitated bacterial colonization of the stent's surface.[28,29] In patients with intestinal orthotopic bladder, the small intestine mucosa is the focus of bacterial colonization.[29–31,44] Draser et al.,[45] have shown the presence of over 10000 microorganisms per 1 milliliter of healthy ileal intestine. Significant bacteriuria is observed in most patients in whom an intestinal segment was used for reconstruction of the lower urinary tract.[33–38]

Urine culture obtained at the moment of removal of the catheter from the intestinal reservoir, approximately 3weeks postoperatively, is positive in all patients.[31,39–41] This should be linked to a prolonged presence of a fomite; the catheter in the urinary tract and the need for systematic flushing of the reservoir in the postoperative period. Bacteriuria is usually asymptomatic and does not require treatment. Routine use of antibiotics in asymptomatic patients with positive urine culture (over 100,000 bacteria per 1mL of urine) may lead to selection of highly resistant pathogens, difficult to eradicate in case of a symptomatic urinary tract infection or urosepsis. Therefore, it is not recommended.[29,33,42–44]

Reid et al.,[45] was the first to demonstrate the formation of biofilms on the ureteral stents and he confirmed the presence of bacterial colonies on the surface of 90% of silicone double-J stents, although clinical symptoms were observed in only 27%. Subsequently, Farshi has confirmed the presence of bacterial colonies on the surface of 68% of ureteral stents, although in only 30% of patients was the urine culture was positive.[28,29,45] This author has also shown the correlation between the urinary tract infection and the duration of ureteral stenting.[46–49] Lifshitz[9] has confirmed the presence of bacterial colonies on the surface of 28-90% of ureteral stents and significant bacteriuria in only 7-34% of patients. Therefore, a negative urine culture does not exclude the presence of bacteria on the surface of the stents. Additionally, the author has shown that prophylactic use of antibiotics does not impede bacterial adherence to the surface of the ureteral stents.[50–55] Liedl & Hofstetter[52,53] have shown that each day of maintaining the catheter in the bladder in a closed system (catheter-bag) increases the risk of urinary tract infection.

On this basis bacteriuria will be present in almost a 100% of patients within a month.[39,40,56–59] In the 1950s, Kass[54] showed that maintaining the catheter in the bladder in the open system facilitates urinary tract infections and the presence of bacteriuria was confirmed by the author in a 100% of patients after only 4days. It is worth mentioning that in patients with orthotopic bladder with maintained ureteral stents there is a need for systematic flushing of the reservoir (every 3-4hours) in the open system, which facilitates ascending urinary tract infection.[60–61] Ramsay & Nickel[28,62,63] have shown the presence of bacterial biofilms on the surface of all catheters which were left in the bladder for more than 7days. The additional factor favoring upper urinary tract infection is the retrograde flow of infected contents, which takes place during the essential postoperative reservoir flushing. The stents left in the urinary tract undoubtedly facilitate this process.

Iwakiri[60] has shown that many patients with orthotopic bladder and pyuria had negative urine cultures. Therefore, in patients with intestinal segment used for the reconstruction of the urinary tract, a urinary tract infection cannot be diagnosed solely on the basis of leukocyturia. The studies of Suriano et al.,[57] confirm this. They demonstrated inversely proportional relations between the number of leukocytes in urine and the number of bacteria in the urinary culture. A small number of leukocytes with a positive urine culture are explained by the tolerance of the intestinal epithelium to bacterial pathogens, (*E. coli*) a normal commensal of intestine (L). By performing urine analysis in children after Bricker's surgery, Bishop has shown the presence of multiple intestinal epithelial cells, which in routine urine analysis were described as leukocytes.[37] The presence of two morphologically similar types of cells in urine from patients with intestinal segment used for the reconstruction of the urinary tract may explain the often misdiagnosis of pyuria in these patients.

Taking into consideration the criteria of diagnosis of postoperative urinary tract infection established by the authors, pyelonephritis was diagnosed in 10 patients (8%). Bricker recommends the use of stents for ureterointestinal anastomosis because the temporary edema of the anastomosis may impede the urinary flow.[7] However, Regan and Barret[39] did not show a statistical difference in the frequency of urine leakage and the number of strictures of the anastomosis in patients with or without stenting after Bricker's ileal conduit surgery.

Conclusion

Conclusion were presented by Skinner,[52] who has shown that the use of ureterointestinal anastomosis stents after draining the urine with the Bricker approach did not affect the postoperative recovery or the frequency of major early complications. Additionally, the shorter time of hospitalization in patients without stenting is, according to the author, an obvious advantage of this approach.[38] By analyzing the results of treatment of 200 patients after ileal bladder substitution, Studer observed symptoms of sepsis in 10 patients in the postoperative period, which were mostly due to the blockage of the ureteral stents. The author recommends earlier removal of the ureterointestinal stents-between day 5 and 8.[64] Furthermore, Mansson[8] describes a higher frequency of anastomotic stricture formation in patients who have had internal stenting. According to the author, the reason for it is the pressure on the anastomosis area created by a rigid stent, which causes edema and ischemia.[65]

Similarly, Gittes[66] observes the possibility of two dangerous consequences of the use of the stents. Firstly, there is a risk of blocking the stent by mucus or a blood clot and impeding the urine flow from the upper urinary tract. Secondly, the direct contact of the rigid stent with the ureter wall in the area of anastomosis may cause ischemia and late strictures. In a prospective study evaluating two groups of patients-with and without stents-Mattei has observed three cases of strictures in the group of stented patients. These results have not been statistically significant, due to a small number of patients in the studied groups (29 and 25 patients).[67] Statistically significant differences were observed in cases of better draining, quicker improvement of intestinal peristalsis and lower frequency of metabolic acidosis in the group with ureterointestinal anastomosis stents.[68]

The urine leakage is improved by good operative technique and efficient drainage of urine from the reservoir. In the group of patients without stenting of the ureterointestinal anastomosis, a Couvelaire catheter with additional side apertures was left in the orthotopic bladder. This catheter allows for efficient flow of urine and intestinal mucus. In light of the presented data, we contend that the routine use of ureteral stents for the supposed facilitation of urine flow is often unnecessary.

The authors found three publications in the urological literature which mentioned that the stenting was not always required after ileal bladder replacement.[39,69] In the authors' opinion, meticulous and a traumatic ureterointestinal anastomosis and efficient evacuation of urine and mucus from the reservoir (facilitated by the use of a Couvelaire catheter with additional side apertures and regular 2hourly diuresis), in our experience, obviates the requirement for stenting of the ureterointestinal anastomosis.

Take home message

Meticulous and a traumatic ureterointestinal anastomosis and efficient evacuation of urine and mucus from the reservoir (facilitated by the use of a Couvelaire catheter), in our experience, obviates the requirement for stenting of the ureterointestinal anastomosis.

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None.

Conflict of interest

The author declares no conflict of interest.

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