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A Comparison of Early Results and Patient Satisfaction Rate between Modified Radical Cystectomy with Mainz II Urinary Diversion and Standard Radical Cystectomy with Continent Ileocecal Urinary Diversion

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Abstract

Background: This study compared the early success, complication and patient satisfaction rates of modified extraperitoneal radical cystectomy (Mainz II urinary diversion) with standard intraperitoneal radical cystectomy (continent ileocecal urinary diversion) in a group of patients with muscle invasive urothelial carcinoma of the urinary bladder.

Methods: From September 2009 until November 2013, this randomized study enrolled 60 patients with muscle invasive transitional cell carcinoma of the urinary bladder who underwent radical cystectomy and urinary diversion. The patients were randomly allocated to two groups via block randomization. Group A included 30 patients (28 men and 2 women) who underwent modified small incision extraperitoneal radical cystectomy with a Mainz II urinary diversion. Group B included 30 patients (27 men and 3 women) who had classic intraperitoneal radical cystectomy and ileocecal continent diversion. The data were extracted and analyzed. The patients were followed for one year after surgery.

Results: Group A patients had a mean age of 61.47±8.63 years. Group B patients had a mean age of 60.77±6.82 years. There were no statistically significant differences in blood loss, electrolyte and acid-base abnormalities, and early post- operative complication rates between the two groups. However, surgical and hospitalization times were significantly shorter in group A (P<0.001). In addition, patients were mobilized earlier and had shorter nothing by moth time. Patient satisfaction rate was significantly more in group A.

Conclusion: Small incision extraperitoneal radical cystectomy and Mainz II urinary diversion is a safe, less complicated, effective and more rapid technique with excellent short term outcome. It seems this technique is a reliable alternative for continent urinary diversion in selected bladder cancer patients, mainly in those with urethral involvement.

Keywords: Mainz II, Radical cystectomy, Bladder tumor

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Introduction

Bladder cancer is the second most common genitourinary cancer after prostate cancer. This cancer is the fourth most common solid cancer in men and seventh to ninth most common cancer in women.[1] It is four times more prevalent in men. More than 90% of bladder cancers originate from the urothelium and are urothelial tumors.[2] These urothelial tumors are broadly classified into two major histological groups. Non-muscle invasive urothelial tumors (NMI-UT) are confined to the submucosa. Despite a high risk of recurrence, progression to the muscular layer is rarely seen and the cancer specific mortality rate is low. The standard of care for NMI-UBT is a transurethral resection of the tumor (TUR). The second group, muscle invasive urothelial tumors (MI-UT) invades the detrusor muscle and adventitia.

In patients with extravesical involvement, approximately one third have recurrence, even after invasive surgery and negative pelvic lymph nodes.[3]

The standard approach in patients with MI-UBT is radical cystectomy and urinary diversion. There are many factors that influence selection of the type of urinary diversion, including comorbidities, patient body figure, expected survival, age, sex and patient choice. Fisch and Hohenfellner[4] have introduced a variation of ureterosigmoidostomy urinary diversion later termed the "Sigma rectum or Mainz II pouch". According to these researchers, this procedure is less technically demanding, easier, more rapid, and does not need a catheter, collection bags or appliances, which also makes the technique more cost effective. In an effort to decrease procedural complexity without violating the principles of oncologic surgery, we have combined small incision extraperitoneal radical cystectomy with Mainz II urinary diversion and compared the early results with classic radical cystectomy and continent urinary diversion.

Patients and Methods

From September 2009 to November 2013, 60 patients with muscle invasive urothelial bladder cancer (T2-T3) enrolled in this study. After description of treatment methods, informed consent was taken. Patients with decreased renal function and hydronephrotic changes of the kidneys were excluded. All patients were randomly allocated into two groups (Table 1). Group A consisted of 30 patients (28 males and 2 females) with a mean age of 61.47±8.63 years (range: 36-75 years) who underwent modified (small incision extraperitoneal approach) radical cystectomy and Mainz II pouch (Figure 1). In this modification we used a low midline infraumbilical incision. Without opening the peritoneum, a classic bilateral pelvic lymph node dissection and radical cystoprostatectomy were performed extraperitoneally. After completion of a cystectomy, a small window was made in the peritoneum to expose the rectosigmoid. The Mainz II urinary diversion was performed as described by Hohenfellner.[4] The ureters were anastomosed to the sigmoid colon at suitable sites after creating submucosal tunnels. We used the principles of detubularization and spherical reshaping of the sigmoid and rectum to make a low pressure reservoir. A drain was put in the Retzius space, while the patients had two rectal tubes for free drainage of urine through the rectum.

Group B consisted of 30 patients (27 males and 3 females) with a mean age of 60.77±6.82 years (range: 42-73 years) who underwent standard intraperitoneal radical cystectomy and an ileocecal pouch. In brief, an extensive midline incision from 2 cm below the xyphoid to the symphysis pubis was made. The peritoneal cavity was entered and explored. A classic pelvic lymph node

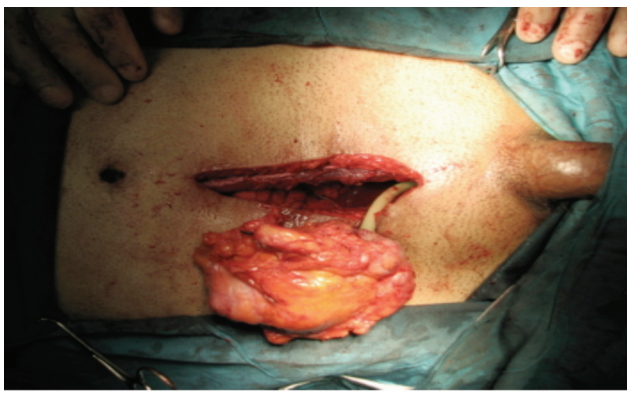

Figure1. Small incision extraperitoneal lymph node dissection and radical cystectomy.

Table 1. Comparison of demographic criteria of patients in groups A and B.

Group (n)	Sex		Age (years) (m ± sd)	Co-morbidity(n)	Habits(n)
	Male	Female			
A (30)	28	2	61.47 ± 8.63	DM* =2 IHD‡=2 COPD∞=1	Smoker=5 Opium=4
B (30)	27	3	60.77 ± 6.82	DM* =3 IHD‡=4 COPD∞=0	Smoker=6 Opium=5

DM*=Diabetes mellitus; IHD‡=Ischemic heart disease; COPD∞=Chronic obstructive pulmonary disease

dissection and radical cystoprostatectomy were performed. A pouch was made from the terminal ileum and cecum using the appendix as the catheterizable Stoma.

After discharge from the hospital, patients returned for follow up one week later and then each month to have renal ultrasound and laboratory exams for a period of one year after surgery. Data were gathered by a questionnaire and analyzed using the t- and chi-square tests.

Results

There was no significant difference in risk factors and co-morbidities between the two groups (Table 1). Two patients in each study group died during the early post-op period secondary to medical complications (myocardial infarction) and urosepsis.

There were no significant differences in blood loss, ICU care and metabolic abnormalities between the groups. A total of 10 patients from each group needed ICU care, however the mean ICU time in group B (26 h) was longer than group A (16 h). The surgical time, hospital stay, NPO time and narcotic injections were significantly less in group A (Tables 2 and 3). Patients in group A had a shorter bed rest time and were mobilized sooner. These patients also showed a more rapid return to normal bowel movements. In group A, one patient had mild pre-op renal insufficiency (Cr=1.9) and developed increased BUN, creatinine and hypocalcemia during the first 60 days after surgery which was alleviated by regular rectal emptying and oral alkalinizing drugs. Bilateral hydronephrosis and pyelonephritis developed in one patient, which was managed with bilateral nephrostomy tubes and antibiotic therapy.

One patient in Mainz II group developed acute abdominal pain 25 days after surgery which was attributed to ischemia of the colon. The patient was treated by colostomy and ileal conduit diversion.

Wound dehiscence was seen in two cases from group A and three from group B, however this difference was not statistically significant. All patients in both groups were continent during the day and night over long-term follow-up. However, one patient in group A had enuresis.

There were similar rates of wound infection, pyelonepritis and sepsis in both groups, which was not statistically significant (Table 3). Although the rate of wound infection and dehiscence was small, there was a remarkable association between history of opium addiction to wound infection (P=0.007) and dehiscence (P< 0.000).

Evaluation of satisfaction was based on two critical questions. 1. Did urinary diversion disturb your daily life? 2. Did urinary diversion meet your expectations? In group A, 90% of patients answered "No" to the first question and "Yes" to the second question, whereas 60% of group B patients responded in the same manner. Patient response of “No” to the first question and “Yes” to the second question was defined as a satisfactory response; any other response was defined as an unsatisfactory response.

Discussion

Simon, in 1852, was the first surgeon who used the bowels for urinary diversion and Coffey in 1905 was the first who described anastomosis of the ureters to sigmoid for urinary diversion.[8] Due to the lack of antibiotics, poor surgical

Table 2. Comparison of surgical, hospitalization and NPO times between groups.

Variable	Group		*P*-value
	A	B	
Surgical time (mean, min)	292	452	<0.001
NPO time (mean, days)	5.20	7.37	<0.001
Hospital stay (mean, days)	8.77	13.43	<0.001

techniques and low standard of care at that time, this type of urinary diversion had unacceptable complications in terms of morbidity and mortality, and was replaced by other procedures such as the ileal conduit.[6]

Fisch and Hohenfellner in 1991 described a type of ureterosigmoidostomy that later was modified and named the "Sigma rectum" or Mainz pouch II urinary diversion. Feasibility and reproducibility were mentioned as two important advantages of the Mainz pouch II. Detubalization of the sigmoid colon makes a capacious low pressure reservoir which decreases the possibility of reflux and pyelonephritis, thus assisting the patient with continence.[4,7]

Improvement of surgical techniques, particularly anti-reflux reimplantation of the ureters to the sigmoid accompanied with long-term antibiotic therapy and alkalinizing agents have decreased infectious complications and mortality rate in the Mainz Pouch II, which makes this technique safe and reliable for urinary diversion in advanced bladder cancer. The early complication rate of the Mainz pouch II is reported to be 6.8%.[7] Hyperchloremic metabolic acidosis is a major complication that may be seen after any technique for urinary diversion that uses bowel segments, particularly in continent diversions and ureterosigmoidostomy. Impaired renal function is a predisposing factor for metabolic acidosis. For prevention of metabolic acidosis and potential bone demineralization over the long-term, patients should take alkalinizing drugs, monitor serum electrolytes and acid-base balances.[8,9] The use of alkalinizing agents is advised to prevent this complication. In various reports, 30%-70% of Mainz II patients must use oral alkalinizing drugs during the first year after surgery; after one year this rate decreases to approximately 8%.[4, 8, 10]

Frequent loose bowel movements and urge incontinence are among most bothersome complications of classical ureterosigmoidostomy that impact quality of life of patients. However, with the Mainz II procedure, the risk of bowel incontinence can be decreased by detubularization of the rectosigmoid segment.[8, 11] In the current study, none of the patients have reported fecal incontinence with the exception of one who has occasional enuresis. All patients can hold for at least two hours during the day, however all need to evacuate at least once at night.

Stenosis at the site of ureteric implantation is reported to be approximately 4% and mostly seen during the first two years after surgery. These patients are managed by retrograde balloon dilatation which is successful in 86% of cases.[10] We have not seen this complication in our patients.

The most serious long-term complication of classic ureterosigmoidostomy is the risk of secondary colon malignancy, which is attributed to formation of a mixture of urine and feces, and exposure of the gastrointestinal epithelium to toxic material. For early diagnosis of these tumors, annual colonoscopy 5-10 years after surgery is recommended.[8, 11]

The Mainz II procedure is a relatively new technique. There is a lack of data regarding long-term complications which should be addressed in future studies. However none of our patients have developed colon cancer during follow up.

Detubularization and spherical reconfiguration of the rectosigmoid segment creates a low pressure and high capacity reservoir which prevents incontinence from one side and reflux of bowel contents into the ureter and pyelonephritis on the other side.[4]

In patients with urethral involvement by the tumor and locally advanced neoplasms where

Table 3: Comparison of surgical & post-surgical factors in the two groups.

Variable	Group A (Mainz II)	Group B (ileocecal)
Surgical factors		
-Mean duration of surgery	-292 minutes	-452 minutes
-Mean blood loss (ML)	-1225cc	-1163cc
-Acid-base abnormality	Mild. Acidosis; 5 pt Mod. Acidosis: 3 pt	Mild.acidosis :8 pt Mod. Acidosis: 3 pt
Electrolytes abnormality	-No	- No
Post-surgical factors		
-Need to ICU care	10 patients	10 patients
-Mean Hb droop the first days after operation	3.38 gr/dl	2.80 gr/dl
-Mean analgesic injection during admission (pethedin)	194.166 mg	313.52 mg
-Time of to get "out of Bed"	1.5 day	2.46 day
-Meantime of beginning diet	5.24 days	7.29 day
-Meantime of hospitalization	8.8 day	13.2 day
-Electrolytes abnormally	Normal K+ :50% Mild hypokalemia:40% Mod hypokalemia:10%	Normal K+ :55% Mild hypokalemia: 40% Mod hypokalemia: 5%
-Increasing, BUN,Cr	2 patients	3 patients
-Wound infection	5 patients	6 patients
-Wound dehiscence	2 patients	3 patients
-Sepsis	2 patients	3 patients
-Pyelonephritis	3 patients	2 patients
- Ureteric implantation site stenosis	None	None
- Day and night incontinence	None	None
-Nocutria	None	None
-Satisfaction rate	27 patients (=90%)	18 patients (=60%)

orthotopic diversion is not indicated, the Mainz pouch II may be a valuable alternative for diversion.[11]

Although orthotopic diversion has the advantage of near normal anatomy, however both the day and night continence rates in orthotopic diversion are reported to be 78%-89% versus 91%-100% in the Mainz pouch II.[11] Most patients need to perform the Valsalva maneuver for evacuation of urine. Approximately 30% of patients need Clean Intermittent Catheterization (CIC) to empty the neobladder.[11] Patients who undergo the Mainz II procedure do not need to perform intermittent catheterization or use any appliances which makes this technique convenient and acceptable by the patient.

Other disadvantages of orthotopic urinary diversion include the risk of urethral recurrence, more technically complex and time consuming surgery, and higher risk of surgical complications. However, the risk of deterioration of the upper urinary tract over the long-term is the same as any other type of urinary diversion.[11,12] Additionally, there are special religious and cultural issues for Muslims patients. Thus, the issue of urinary diversion with no stoma, CIC, or appliance that will give a better body image, particularly in young females, makes the Mainz II an ideal urinary diversion for this group of patients. For most Muslim patients, urinary leakage from diversion and catheterization Stoma is a major problem because of religious concerns.

According to the results of this procedure, decreased surgical and anesthesia times, less manipulation of intraperitoneal organs, shorter ICU care and hospitalization time, and faster

return to normal activities and lifestyle without external application make Mainz pouch II an acceptable diversion.

Preservation of body image has a positive psychosocial effect on patients with the Mainz pouch II. These patients have a nearly normal voiding pattern. In the current study, most patients met their pre-surgical expectations from this surgery and were satisfied regarding personal ability and daily life.

Overall, we believe the Mainz pouch II has a good early outcome, however long-term results remain to be evaluated.

Conclusion

The Mainz pouch II is an effective, safe, less complicated, and cost-effective urinary diversion in selected patients with muscle invasive urothelial bladder tumor. Patients should have competent anal sphincter, normal renal function and no history of pelvic radiotherapy in order to be considered for this procedure.

Conflict of Interest

No conflict of interest is declared.

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