

OUTCOME OF ORTHOTOPIC NEOBLADDER AFTER RADICAL CYSTECTOMY

MA SALAM, MS ISLAM, MM UDDIN, MM SHAFIQR, S HASAN, P SAHA, KR ABEDIN, GM MAULA

Abstract

Objective: To assess the results of patients underwent radical cystectomy and orthotopic neobladder reconstruction (ONR) after radical cystectomy for muscle invasive transitional cell carcinoma of urinary bladder.

Patients And Methods: The medical records were retrospectively reviewed for 154 suitable consecutive patients undergoing radical cystectomy and orthotopic neobladder reconstruction between July 1998 and June 2007 in BSMMU Hospital and in a private medical institution at Dhaka, Bangladesh. The operating time, transfusion rates, complications, mortality rates, continence rates, potency rates, disease specific survival and overall survival were reviewed.

Results: The median (range) follow-up was 48 (6–113) months; all patients had a reconstruction with a 'Studer' type of neobladder. Retrospective review was possible in 98 patients. Data of other patient were incomplete or inadequate for result of potency and continence review. Full continence was defined as being dry and with freedom from pads. Continence could be assessed in 98 patients after orthotopic neobladder reconstruction. 96 patient out of 98 (97.95%) were classified as being fully continent, and two (2.40%) patient who were fully incontinent. The daytime continence rate was 99% (97 patients) and the nocturnal continence rate was preserved in 90 patients (91.83%). Of the 98 patients, 93 patients could empty their bladder leaving a residual urine less than 100 ml with a mean flow rate 12.5 ml/sec. Only five patients used (5.10%) intermittent self-catheterization (ISC). All of them had a very large neobladder, of 600 ml capacity or more. Of the 98 men with an orthotopic neobladder, 69 (70.40%) were potent before surgery (potency being defined as the ability to achieve and maintain an 'unaided' erection sufficient for sexual intercourse). Of these 69 patients, 57 (82.60%) were potent and 12(17.39%) were impotent after surgery. The patient who developed erectile dysfunction after surgery was given sildenafil 50 to 100 mg two hours prior to sexual contact. Of the 154 patients with malignancy after a median (range) follow-up of 48 (6–113) months, 109 (70.77%) remained alive with no sign of disease recurrence. During this period of follow up 32

patients developed tumor recurrence died from disease progression confirms the disease specific mortality was 20.77%. about, and 13 (8.44%) died from other causes indicate the over all survival is 79.22%

Conclusions: Orthotopic neobladder reconstruction provides excellent continence rates, and both acceptable complication and mortality rates. Suitable patients undergoing radical cystectomy should be offered orthotopic neobladder reconstruction.

Keywords: Radical cystectomy, Orthotopic neobladder reconstruction.

Introduction

If it is possible to create a new urinary bladder and if the patient can pass urine through the normal urethra, this would be the best gift for a patient whose bladder has to be removed for any reason for example after radical cystectomy^{1,2,4}. This innovative idea is a new approach of quality care in this part of the world. Following radical cystectomy the standard time tested gold urinary diversion has been the ileal conduit, but in the last 15 years efforts have been made to preserve the patients' body image by constructing continent bladder substitutes¹.

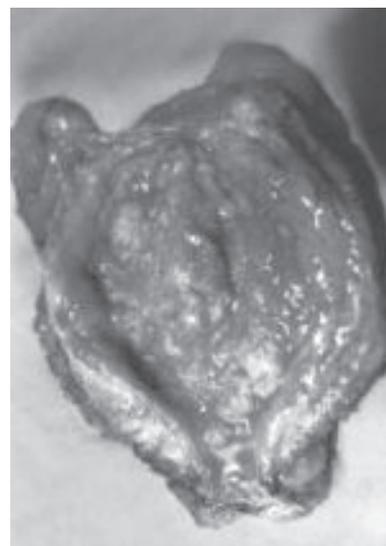


Fig : Resected specimen and sketch describing principle of neobladder reconstruction (ONR)

An orthotopic neobladder shares several normal bladder characteristics, which include a continence mechanism, adequate capacity at a low intravesical pressure and an antireflux mechanism capable of preventing upper tract dilatation¹. The creation of a neobladder by Camey and Le Duc² from small intestine, with preservation of the urethral sphincter mechanism at cystectomy, showed that this procedure was technically feasible. Several methods of neobladder construction have since been reported [3–6]. Studer et al.⁷ reported the use of a detubularized ileal pouch as a bladder substitute in patients with an intact urethra after cystectomy. Continent urinary diversion via an orthotopic neobladder offers patients distinct advantages over an ileal conduit^{8,9}. These include the potential for near normal voiding function, continence, easier urethral surveillance with a lowered urethral recurrence rate, and a superior body image.

Orthotopic neobladder reconstruction tends to be reserved for 'selected patients', partly because of the perceptions that the procedure is technically difficult and is associated with a higher rate of both peri operative and long-term morbidity.

In this paper we report a single centre experience of orthotopic neobladder reconstruction after radical cystectomy, assessing operative duration, transfusion rates, complications, continence, potency and cancer control.

Patients And Methods

All suitable patients scheduled for cystectomy should have the option of ONR. Any interested patient should be carefully counselled and where possible have the opportunity to meet other patients who have had an ONR. Careful selection of patients before surgery is required to ensure that they are sufficiently motivated to comply with voiding re-education and long-term urethral follow-up.



Fig: Graphic illustration of ONR



Fig: ONR is in progress

Contraindications to ONR are tumour in the prostatic urethra, other urethral diseases such as stricture, lack of understanding and motivation, body habitus, and rare local anatomical conditions such as shortness of the mesentery (discovered during surgery) and inflammatory bowel disease (e.g. Crohn's disease) affecting the chosen segment^{21,23}.

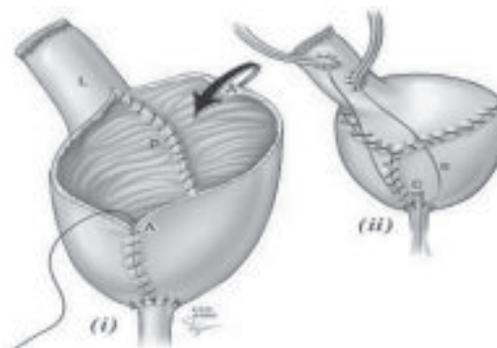


Fig: Neobladder reconstruction on progress

Between June 1994 and April 2003, 154 suitable consecutive patients (141 men and 13 women, median age 62 years, range 38–80) had a radical cystectomy and orthotopic neobladder reconstruction; all patient had invasive bladder neoplasm (151 TCC, two adenocarcinoma and one squamous cell carcinoma), and all had a modified Studer ileal neobladder.



Fig: Reconstructed orthotopic neobladder (ONR)

Studer neobladder, the surgical technique was similar to that proposed by Studer et al.¹⁰, whereby a portion of terminal ileum 54–60 cm long was isolated 25 cm from the ileocaecal valve. The segment of ileum was opened at the antimesenteric border, the margin of the resulted flat ribbon was approximated by a running continuous suture to make wider ribbon. Now the wide ribbon was reduplicated again to complete the sealed pouch. This form of neobladder, first developed by Hautmann et al.^{11,12}, is an intentionally large-capacity reservoir designed in an attempt to decrease the incidence of nocturnal incontinence. After surgery all patients were followed for oncological and functional evaluation; the median (range) follow-up was 48 (6–113) months.

Results

The mean operating time was 300 (195–510) min, Mean hospital stay 14 (11–42) days, blood loss 1000 (700–1500) mL. Blood transfusion rate was required in all patients. Complications were classified as early if they occurred within 30 days after surgery and late thereafter. There was one early death 5 days after surgery, from severe pneumonia burst abdomen and septicemia unresponsive to aggressive treatment.

Since orthotopic neobladder reconstruction (ONR) after radical cystectomy is a long procedure, early complications was not uncommon. Paralytic ileus was observed in 28 cases. They were temporary clinical problem and recover all with conservative medical treatment. Chest and wound infections were treated with appropriate antibiotics. Two patients had developed deep vein thrombosis (occurring at 10 and 12 days) both were anticoagulated and improved. A pouch leak occurred in two patients, both managed conservatively. There were six cases of Urosepsis requiring treatment with specific antibiotic therapy. Re-operation was required in two patients, caused by small bowel obstruction, re-suturing of the abdomen was performed in five patient those who had burst abdomen. After dehiscence (three), bleeding (one), and a ureteric anastomotic leak (one). The small bowel obstructions were managed by simple freeing of adhesions. Reanastomosis was required in the two patients with the leak from the initial uretero-ileal anastomosis. Intra peritoneal abscess was identified in two patients of which one needed intervention in the form of aspiration of purulent material under ultra sound guide. Myocardial infraction was seen in three patients and all of them survived with medical treatment in cardiac hospital. One patient developed anastomotic leak from ileum who had laparotomy on the 5th post operative

day and an ileostomy was created. But the patient developed septicemia which could not be controlled and the patient expired on 14 th post operative day.

Early complications

Paralytic ileus	28
Wound infection	08
Chest infection	04
Urosepsis	06
Uretero-enteric leak	02
Pouch leak	02
Burst abdomen	05
Intestinal obstruction	02
Intraperitoneal abscess	02
Myocardial infarction	03
Ileal anastomotic leak and Septicemia	01

Late complications includes five patients with an incisional hernia, two were surgically repaired. A neobladder calculus was found in one patient 2 years after surgery, which was treated by endoscopic litholopaxy. One patient developed stone around stents with in a course of eight weeks. There was one case of left VUR presenting 7 months after surgery with recurrent urinary tract infection; this was treated with low dose chemoprophylaxis, and resolved the symptoms.

At three months all the patient was evaluated with ultrasound cystodynamics which includes an ultrasound assessment to image the upper and lower urinary tract and also the post void residue. Uroflowmetry was performed to record the flow of urine. In 9 cases formal urodynamics was performed. All urodynamic finding were similar. The neobladder was large capacity and found to be of having low pressure system empty its content satisfactorily.

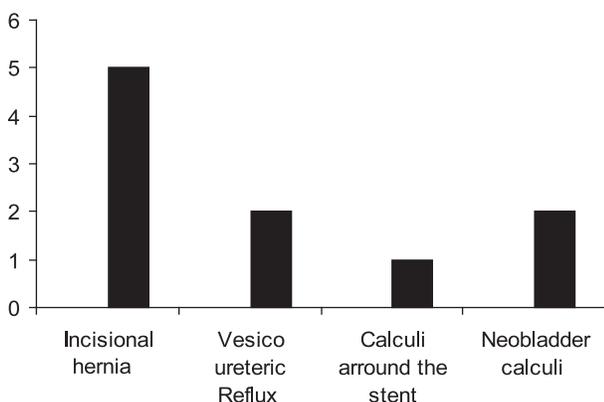
Retrospective review was possible in 98 patients. Data of other patient were incomplete or inadequate for result of potency and continence. Full continence was defined as being dry and with freedom from pads. Continence could be assessed in 98 patients after orthotopic neobladder reconstruction. 96 patient out of 98 (97.95%) were classified as being fully continent, and two (2.40%) patient who were fully incontinent. The daytime continence rate was 99% (97 patients) and the nocturnal continence rate was preserved in 90 patients (91.83%). Of the 98 patients, 93(94.89%) patients could empty

their bladder leaving a residual urine less than 100 ml with a mean flow rate 12.5 ml/sec. Only five patients used (5.10%) intermittent self-catheterization (ISC). All of them had a very large neobladder of 600 ml capacity or more. Of the 98 men with an orthotopic neobladder, 69 (70.40%) were potent before surgery (potency being defined as the ability to achieve and maintain an 'unaided' erection sufficient for sexual intercourse). Of these 69 patients, 57 (82.60%) were potent and 12 (17.39%) were impotent after surgery. The patient who developed erectile dysfunction after surgery was given sildenafil 50 to 100 mg two hours prior to sexual contact.

Of the 154 patients with malignancy after a median (range) follow-up of 48 (6–113) months, 109 (70.77%) remained alive with no sign of disease recurrence. During this period of follow up 32 patients developed tumor recurrence died from disease progression confirms the disease specific mortality was 20.77%. about , and 13 (8.44%) died from other causes indicate the disease specific survival is 85.71%

Late complications

Incisional hernia	5
Vesico ureteric Reflux	2
Calculi around the stent	1
Neobladder calculi	2



Urodynamic finding

Mean pouch capacity	:	562.5 ml.
Mean peak flow rate , mL/s	:	12.5 ml
Mean Post void residual urine	:	76 mL

Mortality

Disease specific mortality	n=32	20.77%
Other cause of death	n=13	08.44%
Over all mortality(48 month)	n=45	29.21%
Disease specific survival (48 month)	n=132	85.71%

Discussion

Gold standard treatment of the muscle invasive bladder cancer is radical cystectomy[1,2,3,5,6] The standard treatment for urinary diversion has been the ileal conduit, but in the last decade and a half, efforts have been made to preserve patient body image and quality of life by constructing continent bladder substitutes¹. An orthotopic neobladder shares several normal bladder characteristics, which include a continence mechanism, adequate capacity at a low intravesical pressure and an antireflux mechanism to prevent upper tract dilatation^{1,3,5,6}.

Lemoine in 1913 was credited with the first orthotopic reconstruction in a human. The patient initially underwent cystectomy and ureteric re-implantation into the rectum. Because of recurrent episodes of pyelonephritis the patient had a second procedure whereby the rectal segment was isolated and anastomosed onto the native urethra. The sigmoid colon was then re anastomosed to the anus. In 1979 Camey and Le Duc³ reported their experience of creating a neobladder from small intestine, with preservation of the urethral sphincter mechanism at cystectomy, and by doing so showed that this procedure was feasible. Several methods of neobladder construction have since been reported⁴⁻⁷.

Orthotopic Neo bladder Reconstruction (ONR) offers distinct advantages over an ileal conduit. These include the potential for near-normal voiding, continence, easier urethral surveillance with a lowered urethral recurrence rate, and a better body image^{7,8,9,10}. In many centers worldwide, ONR has replaced the ileal conduit as the standard form of reconstruction^{11,12}. Despite this, ONR tends to be reserved for 'selected patients' partly because the procedure is perceived to be technically difficult and associated with a higher rate of both perioperative and long-term morbidity.



Fig: Micturating Cystourethrogram following ONR

Despite these advantages, potential candidates for orthotopic neobladder reconstruction are still choosing ileal conduit diversion. This is because the former procedure is perceived to be both technically challenging and associated with an increase in both morbidity and mortality. This perception was explored by Gburek et al.¹³, who compared the outcomes of orthotopic ileal neobladder (Studer type) and ileal conduits; these authors concluded that an orthotopic neobladder reconstruction is safe and with similar perioperative and long-term morbidity to an ileal conduit. This was the case even if the cystectomy was a salvage one, and even if the patient had co morbidity factors^{13,16}. In the present study, the operative duration recorded for the orthotopic neobladder reconstruction compares favorably with those previously reported [14]. Although of longer duration with a longer inpatient stay than an ileal conduit we consider that, with increased experience, the operative duration for orthotopic reconstruction will decrease. The median blood loss in this series is 1000 mL and the transfusion rate of 100% is similar to that in our experience of constructing an ileal conduit. Patients with other comorbidities that increase their anesthetic risk are excluded from orthotopic reconstruction, in theory to decrease their chances of re-operation and both intra- and postoperative complications. The re-operation rate for the ileal conduit is reported to be 10–14% [13,15]. From the present series, the proportion of patients requiring a second laparotomy was 8%, similar to that of other reported series (9.6–15%)^{23,15}.

The early and late complication rates for the present series were 23% and 13%, respectively; the early rate was slightly higher than previously reported rates of 9–18%; this rate may decrease as experience with the technique increases. However, early complications were generally self-limiting and managed conservatively, with no influence on the overall outcome. The late

complication rate (13%) was consistent with previous reports (6–24%)^{1,13,16,17}. In the present study the mortality rate was 1% (one death from severe septicemia following anastomotic leak 5 days after surgery), consistent with other reported rates for orthotopic neobladder reconstruction. The mortality rate for cystectomy and ileal conduit formation has been reported as < 2%^{18,19}.

Of the 154 patients with malignancy after a median (range) follow-up of 48 (6–113) months, 109 (70.77%) remained alive with no sign of disease recurrence. During this period of follow up 32 patients developed tumor recurrence died from disease progression confirms the disease specific mortality was 20.77%, and 13 (8.44%) died from other causes indicate the disease specific survival is 85.71% is consistent with other series^{19,20,21}.

After ONR, continence is probably influenced by the characteristics of the reservoir (large capacity and low pressure) and the rhabdo sphincteric mechanism. Essential to maintaining continence after ONR is the minimal manipulation of the muscle fibers, facials attachments and innervations of the rhabdo sphincter. Nerve-sparing procedures improve not only subsequent potency but also continence, probably by preserving the innervations of the smooth muscle component of the external sphincter. In all patients, voiding occurs via the native urethra and is initiated by abdominal straining. The patient determines the time to void, either by a feeling of abdominal fullness or by following a strict regimen of 'voiding by the clock' every 4–6 h (because of the poorly localized feeling of bladder 'discomfort' at capacity). Patients are encouraged to 'double void' to ensure that their neobladder are empty. Should patients 'void by the clock' they are encouraged to set an alarm clock to awaken and then empty their neobladder once at night. In the present series, the daytime continence rate was 99%; values reported in other series are 92–

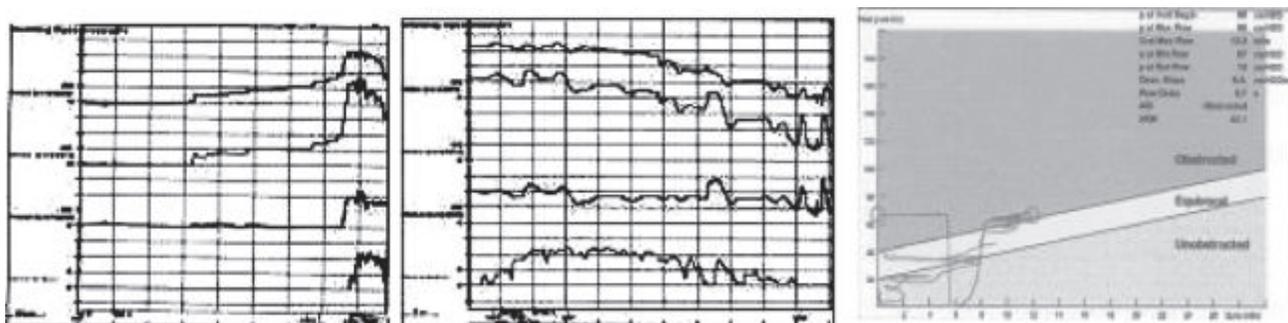


Fig: Urodynamic tracing of a patient following ONR

98%^{1,17,18}. In the present series 78% of patients were continent at night, again similar to the 74–83% nocturnal continence rates reported previously^{1,17,18}. The median (range) time to achieve full continence was 4 (1–12) months, again similar to that reported by others¹⁴. Five of the patients in the present series used ISC, the incidence of which varies after orthotopic neobladder reconstruction, depending on the capacity of the of neobladder. We realized that when the neo bladder capacity is too large the emptying of the bladder is poor conversely neobladder of smaller capacity empties better.

In the present series, 70.77% of patients were alive and well with no sign of recurrence at a median follow-up of 48 months. In this period 20.77% died from tumour recurrence resulting in disease progression. Although the recurrence rate is acceptable, it is important that patients choosing an orthotopic neobladder understand the potential risk of a urethral recurrence and the need for long-term surveillance of the retained urethra. Men undergoing orthotopic diversion, even with high-risk factors for urethral recurrence, appear to have a lower incidence of urethral recurrence than those undergoing cutaneous diversion²²; the exact reasons for this are unclear. We recommend that all suitable patients undergoing radical cystectomy should be considered for orthotopic neobladder reconstruction, contraindications to this being staging of > pT2b, TCC in the prostatic urethra, other urethral diseases, e.g. stricture, lack of understanding and motivation, habitus, and rare local anatomical conditions such as shortness of the mesentery (discovered during surgery) and inflammatory bowel disease (e.g. Crohn's disease)

The resulting quality of life is an important determinant for patients considering an orthotopic neo bladder reconstruction (ONR). Bladder substitutions have a cosmetically more appealing result than ileal conduits, as a urostomy appliance is not required. In addition, there are documented improvements in the quality of life when compared to an ileal conduit²³⁻²⁵. Yoneda et al. using the Sickness Impact Profile questionnaire, reported that quality of life was better in the neobladder than the ileal conduit group, especially in terms of mental, physical and social functioning in daily life²⁴.

Conclusion

In the present series the vast majority of patients undergoing orthotopic neobladder reconstruction were continent, avoiding the need for a cutaneous stoma or external urostomy appliance, thus helping them to retain

their body image. The results show that not only are the continence rates excellent, but there is no greater morbidity and mortality than the gold standard urinary diversion the ileal conduit. Moreover the cost of the external appliance for lifetime is too expensive for the patients. Despite these advantages, careful patient selection and counseling are required to ensure that patients are sufficiently motivated to comply with voiding re-education and long-term urethral follow-up. Patients satisfying the criteria for orthotopic neobladder reconstruction should be offered it, and the orthotopic reservoir should now be considered with the ileal conduit as 'best practice' in urinary diversion after radical cystectomy. All patients undergoing cystectomy should now have the option of a neobladder reconstruction and this technique is going to set a new Gold standard.

Acknowledgement

We gratefully acknowledge the contribution of all the staffs of department of urology, BSMMU, Comfort Nursing Home Pvt.Ltd.

References

1. Benson MC, Seaman EK, Olsson CA. The ileal neobladder is associated with a high success and low complication rate. *J Urol* 1996; 155 : 1585–8
2. Camey M, Le Duc A. L'entérocystoplastie avec cystoprostatectomie totale pour cancer de la vessie. Indications, technique opératoire, surveillance et résultats sur quatre-vingtsept cas. *Ann Urol (Paris)* 1979 13 : 114–123
3. Light JK, Marks JL. Total bladder replacement in the male and female using the ileocolonic segment (Le Bag). *BJU Int* 1990; 65 : 467–72
4. Melchior H, Spehr C, Knop-Wagemann I, Persson MC, Junemann KP. The continent ileal bladder for urinary tract reconstruction after cystectomy: a survey of 44 patients. *J Urol* 1988; 139 : 714–8
5. Hautmann RE, Miller K, Steiner U, Wenderworth U. The ileal neobladder: 6 years of experience with more than 200 patients. *J Urol* 1993; 150 : 40–5
6. Kock NG, Ghoneim MA, Lycke KG, Mahran MR. Replacement of the bladder by the urethral Kock pouch: functional results, urodynamics and radiological features. *J Urol* 1989; 141 : 1111–6
7. Studer UE, Ackermann D, Cassanova GA, Zingg EJ. Three years' experience with an ileal low pressure bladder substitute. *Br J Urol* 1989; 63 : 43–52

8. Martins FE, Bennett CJ, Skinner DG. Options in replacement cystoplasty following radical cystectomy: high hopes or successful reality. *J Urol* 1995;153:1363–72
9. Bjerre BD, Johansen C, Steven K. Health-related quality of life after cystectomy: bladder substitution compared with ileal conduit diversion. A questionnaire survey. *Br J Urol* 1995; 75 : 200–5
10. Studer UE, Casanova GA, Luisier J, Zingg EJ. Bladder substitute realized by means of an ileal segment. *J Urol (Paris)* 1988; 94 : 273–7
11. Hautmann RE, Egghart G, Frohnberg D, Miller K. The ileal neobladder. *J Urol* 1988; 139:39–42
12. Stein JP, Lieskovsky G, Ginsberg DA, Bouchner BH, Skinner DG. The T pouch: an orthotopic ileal neobladder incorporating a serosal lined ileal anti reflux technique. *J Urol* 1998; 159: 1836–42
13. Gburek BM, Lieber MM, Blute ML. Comparison of Studer ileal neobladder and ileal conduit urinary diversion with respect to Perioperative outcome and late complications. *J Urol* 1998; 160 : 721–3
14. Rogers E, Scardino P. A simple ileal substitute bladder after radical cystectomy: experience with a modification of the Studer pouch. *J Urol* 1995; 153 : 1432–8
15. Hautmann RE, de Petriconi R, Gottfried HW, Kleinschmidt K, Mattes R, Paiss T. The ileal neobladder: complications and functional results in 363 patients after 11 years of follow up. *J Urol* 1999; 161 : 422– 8
16. Studer UE, Danuser H, Merz VW, Springer JP, Zingg EJ. Experience in 100 patients with an ileal low pressure bladder substitute combined with an afferent tubular isoperistaltic segment. *J Urol* 1995; 154 : 49–56
17. Cancrini A, De Carli P, Pompeo V et al. Lower urinary tract reconstruction following cystectomy. experience and results in 96 patients using the orthotopic bladder substitution of Studer et al. *Eur Urol* 1996; 29 : 204–9
18. Lerner SP, Skinner E, Skinner DG. Radical cystectomy in regionally advanced bladder cancer. *Urol Clin North Am* 1992; 19 : 713–23
19. Skinner DG, Lieskovsky G. Contemporary cystectomy with pelvic node dissection compared to preoperative radiation therapy plus cystectomy in management of invasive bladder cancer. *J Urol* 1984; 131 : 1069–72
20. Studer UE, Danuser H, Hochreiter W, Springer JP, Turner WH, Zingg ET. Summary of 10 years' experience with an ileal low-pressure bladder substitute combined with an afferent tubular isoperistaltic segment. *World J Urol* 1996; 14 : 29–39
21. Kulkarni JN, Pramesh CS, Rathi S, Pantvaidya GH. Long-term results of orthotopic neobladder reconstruction after radical cystectomy. *BJU Int* 2003; 91 : 485–8 22
22. Benson MC, Seaman EK, Olsson CA. The ileal neobladder is associated with a high success and low complication rate. *J Urol* 1996; 155 : 1585–8
23. Meyer J-P, Drake B, Boorer J, Gillatt D, Persad R, Fawcett D. A three-centre experience of orthotopic neobladder reconstruction after radical cystectomy: initial results. *BJU Int* 2004; 94 : 1317– 21
24. Yoneda T, Igawa M, Shinna H, Shigeno K, Urakami S. Postoperative morbidity, functional results and quality of life of patients following orthotopic neobladder reconstruction. *Int J Urol* 2003; 10: 119–25 28
25. Hobisch A, Tosun K, Kinzl J et al. Quality of life after cystectomy and orthotopic neobladder versus ileal conduit urinary diversion. *World J Urol* 2000; 18: 338–44

Authors:

Uro-Oncology Division, Department of Urology, Bangabandhu Sheikh Mujib Medical University, Sahabagh Avenue, Dhaka 1000.