

# Laparoscopic radical cystectomy: neobladder or ileal conduit, debate still goes on

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**Objective** To compare the pre, intra, and post-operative data between ileal conduit and neobladder urinary diversions during laparoscopic radical cystectomy(LRC).

**Material and methods** Between 2006 and 2011, 63 patients who underwent LRC and urinary diversion had their data input prospectively into a database and said data used for the analysis. The outcome comparators were the patient demographics, operative time, conversion rate, blood loss, transfusion rate, morphine analgesic requirement, length of hospital stay, complication rates, follow up, and quality of life assessments. A Mantel–Haenszel test was used for dichotomous data and an inverse variance method was used for continuous data. P values less than 0.5 were considered significant

**Results** Thirty-nine patients (60 ±7.11 years) had ileal conduits and 24 patients (57 ±8.68 years) had neobladder urinary diversion. No difference was found (P >0.05) regarding age, BMI, smoking history, TURBT pathology result, blood loss, blood transfusion requirement, conversion rates, length of hospital stay, morphine requirement, complications, or follow-up and quality of life. The neobladder groups did have more previous abdominal operations and had significantly longer operative time.

**Conclusions** We found no difference between either types of diversion in all comparative aspects except that the neobladder had longer operative times. This is the first comparative study between ileal conduit and neobladder urinary diversion after laparoscopic radical cystectomy and can pose as a benchmark for future comparisons.

**Key Words:** bladder cancer ◊ laparoscopy ◊ laparoscopic radical cystectomy ◊ lymph node dissection ◊ radical cystectomy

## INTRODUCTION

Worldwide, about 357,000 new cases of bladder cancer are diagnosed yearly and it is the cause for about 145,000 deaths [1]. With numerous treatment modalities, radical cystectomy (RC) is considered the gold standard of treatment of muscle invasive high grade bladder cancer [2].

Traditionally, RC is performed by an open surgical technique; however, more recently, a minimally invasive approach has been established in numerous centres across the world [3, 7]. In fact, with the

advancement of laparoscopy equipment and the increased skills of urologists performing minimally invasive surgery, laparoscopic radical cystectomy (LRC) has become a viable alternative to open radical cystectomy (ORC).

The question remains of how to perform the urinary diversion best. Operative time is prolonged during LRC mainly due to the urinary diversion rather than the actual bladder removal [2]. Currently, two more popular options for two methods are available: an intracorporeal and extracorporeal approach for ileal conduit or neobladder formation [2]. However,

extracorporeal diversion seems to be the most favourable, as it reduces the operative time and has comparable postoperative results to the intracorporeal technique [8].

Many factors determine which diversion technique is to be performed. Neobladders are generally performed in younger patients with less co-morbidities; however, it remains the more prevalent technique used during ORC [9, 10].

In a review of the literature of the studies reporting on 50 or more LRC procedures, we found that neobladder formation was 2.5 times more prevalent than conduit formation (130 conduits: 315 neobladders) [11]. Furthermore, numerous studies, including a Cochrane review, have reported on the comparison of conduits and neobladders, with no definite unanimous superiority of one over the other [12–19]. However, these studies were on ORC with no comparison of LRC conduit and neobladders found in the literature.

To this end, we aimed to compare the data of patients who underwent LRC and ileal conduit formation to that of patients who underwent LRC and neobladder formation regarding pre, intra, post-operative data, and follow up.

## PATIENTS AND METHOD

### Material

Between February 2006 and March 2011, 63 patients with pathologically confirmed muscle invasive bladder cancer who underwent laparoscopic radical cystectomy and urinary diversion were included. An experienced laparoscopic surgeon performed the LRC procedure. The data for all the patients was input prospectively into a database. All patients had a post-transurethral resection of bladder tumour (TURBT) pathologically proven and a staging computed tomography (CT) scan proven organ confined T2N0M0 bladder cancer disease. All patients were counselled regarding the procedure and type of urinary diversion and informed written consent was given. Patients' families were involved in the process to determine which diversion technique would best suit the patient and allow for optimal quality of life preservation. The study was conducted on these patients in accordance with the International Conference on Harmonization guidelines for Good Clinical Practice and the Declaration of Helsinki (September 2004 version).

### Laparoscopic cystectomy

The LRC procedure was started with establishing a pneumoperitoneum and the insertion of two 5–

mm and three 10–mm trocars. We used the ligasure system, harmonic scalpel, bipolar scissors, metal and plastic clips to dissect the tissue and ligation of vessels. After identifying the ureters, we start with dissection of the bladder base, seminal vesicles, and posterior surface of the prostate. After dissection of the Retzius space, we incised the pelvic fascia and followed with dissection of the prostate apex and dissection of the urethra. Obturator, external, internal, common iliac, presacral, para-aortic and paracaval lymph nodes were all dissected for pathological analysis. The specimen was removed into a silicon bag. In females, the procedure was started from dissection of the uterus ligaments and peritoneum in the Douglas cavity. The bladder, along with the urethra, uterus, adnexa with anterior vaginal wall and lymph nodes, was removed transvaginally.

### Urinary diversion

Urinary diversions are performed via a minilaparotomy technique with the left ureter carried on to the right side under the sigmoid colon mesentery. Ileal neobladders are formed according to the technique described by Studer et al. A 14F drain was left in the abdominal cavity after surgery.

The type of diversion is dependent on the intraoperative findings, but more so on the pre-operative counselling of the patient, their relatives and their expectations and preferences. However, where more advanced disease or significant dilatation of the ureters was found, a conduit was formed.

### Outcome measures and analysis

The outcome measures evaluated were the patients' demographics, cystectomy pathology grading, operative time, conversion rate, blood loss, transfusion rate, morphine analgesic requirement, length of hospital stay, complication rates, and erectile dysfunction.

The complications were classified according to the Clavien classification (CC) of surgical complications. We considered CC I and II as minor complications and CC III and above as major.

All CT scans were reported by experienced uro-radiologists and all specimens were analysed by experienced pathologists. All statistical analysis was conducted using the Review Manager (RevMan) programme (version 5.1. The Nordic Cochrane Centre, the Cochrane Collaboration, 2011). A Mantel-Haenszel test was used for dichotomous data and an inverse variance method was used for continuous data. P values less than 0.05 were considered significant.

## Follow up

Patients were seen in the clinic one month postoperatively, then every three months for the first year, every six months for the next year, and finally on a yearly basis. Follow-up investigations consisted of transabdominal ultrasound, CT and routine blood tests. Quality of life (QoL) was assessed during their follow up, based on their psychological, social, sexual and physical states to ensure that the patients were coping.

## RESULTS

### Patient data

During the 5-year period, 58 men and 5 women had laparoscopic cystectomy procedures, of which 39 patients had ileal conduits and 24 had neobladders. Table 1 depicts the patients demographics.

There was no difference between the groups regarding the age, BMI, smoking history or TURBT histology results ( $P = 0.15$ ,  $P = 0.17$ ,  $P = 0.28$ ,  $P = 0.05$ , respectively). The neobladder group did however have

significantly more patients with previous operations ( $P = 0.02$ ).

### Operative data

There was no significant difference between the ileal conduit group and the neobladder group regarding intraoperative blood loss ( $P = 0.67$ ), blood transfusion rate ( $P = 0.58$ ), conversion rates ( $P = 0.15$ ), or lymph node yield ( $P = 0.9$ ). However, the neobladder group had significantly longer operative time than the conduit group ( $P < 0.0001$ ).

### Postoperative data

There was no difference between the two groups regarding length of hospital stay ( $P = 0.83$ ), morphine requirement ( $P = 0.34$ ), and neither groups had positive margins.

### Complications

Though there were more intra-operative injuries in the ileal conduit group, this did not reach statistical

**Table 1.** Patients demographics and operative parameters

	Total	Ileal conduit	Neobladder	
Sex (M:F)	58:5	34:5	24:0	
Age mean $\pm$ SD [median (range)]	59 $\pm$ 7.8 (67 (34–72))	60 $\pm$ 7.11	57 $\pm$ 8.68	$P=0.15$
Previous Operations	14.3% (9/63)	7.7% (3/39)	33.3% (8/24)	$P=0.02$
BMI (mean $\pm$ SD)	27.5 $\pm$ 2.2	27.2 $\pm$ 2.3	27.96 $\pm$ 2	$P=0.17$
Smokers	90.5% (57/63)	87.2% (34/39)	95.8% (23/24)	$P=0.28$
TURBT Path:				
G2pT2	84.1% (53/63)	74.4% (29/39)	100% (24/24)	$P=0.05$
G3pT2	15.9% (10/63)	25.6% (10/39)	0	$P=0.05$
Operative Time [minutes (mean $\pm$ SD)]	295 $\pm$ 26	285 $\pm$ 22.4	312 $\pm$ 23.1	$P<0.0001$
Blood Loss [ml (mean $\pm$ SD)]	251.43 $\pm$ 96.5	255.4 $\pm$ 100.13	245 $\pm$ 92.03	$P=0.67$
Blood transfusion	11.1% (7/63)	12.8% (5/39)	8.3% (2/23)	$P=0.58$
Conversion	6.4% (4/63)	2.6% (1/39)	12.5% (3/24)	$P=0.15$
Extended LND	63	39	24	
LN yield	18.1 $\pm$ 3.42	18 $\pm$ 3.9	18.1 $\pm$ 2.5	$P=0.9$
Length of hospital stay	9.3 $\pm$ 1.9	9.3 $\pm$ 2.3	9.4 $\pm$ 1.3	$P=0.83$
Morphine requirement [days (mean $\pm$ )]	3.7 $\pm$ 0.8	3.8 $\pm$ 0.8	3.6 $\pm$ 0.8	$P=0.34$
Cystectomy Path:				
G2pT2b	37	15	22	
G2pT3a	8	6	2	
G2pT3a N1	1	1		
G2pT3b N1	5	5		
G3pT3a	5	5		
G3pT2b N1	1	1		
G3pT3a N1	4	4		
G3pT3b N1	1	1		
G3pT4a N1	1	1		

significance (Table 2). Furthermore, all the patients with intra-operative injuries (9/63) had uneventful recoveries except for one patient with a bowel injury (in the conduit group) which proceeded into post-operative obstruction requiring re-operation. Dividing the cohort into half representing the initial learning curve, it is worth noting that all the intra-operative injuries were from the initial series conducted, with no intra-operative injuries in the second half (9/32 *vs.* 0/31;  $P = 0.03$ ).

Despite the majority of the complications being minor (C-class I&II), there was no significant difference regarding any of the post-operative complications between the two groups (C-class 1 ( $P = 0.05$ ), C-class II ( $P = 0.23$ ), and C-class V ( $P = 0.86$ ), with no C-class III or IVs). Furthermore, there were no significant differences when comparing individual complications (Table 2) between the groups (all  $P > 0.05$ ). In addition, there was no difference between the two groups if individual patients that developed post-operative complications were compared (conduit: 16/39 *vs.* 13/24;  $P = 0.31$ ). Three patients developed post-operative sepsis and succumbed to their illness despite vigilant efforts.

**Table 2.** Complications

Intraoperative injuries:				
Bowel	4	3	1	$P=0.58$
Rectal	3	3	0	$P=0.31$
Vascular	2	1	1	$P=0.73$
Total	9/63	7/39	2/24	$P=0.3$
Postoperative complications:				
Sepsis	3	2	1	
Urine retention	1	0	1	
Bleeding	6	4	2	
Thrombo-embolism	4	3	1	
Neurologic	3	3	0	
Muscular	1	1	0	
Ileus	10	6	4	
Cardiac	1	0	1	
Ureteral stenosis	12	8	4	
Urine leak	3	0	3	
Lymph leak	3	2	1	
C – classification per patient:				
I	22	10	12	$P=0.05$
II	4	4	0	$P=0.23$
IIIa	0			
IIIb	0			
IVa	0			
IVb	0			
V	3	2	1	$P=0.86$

## Pathological data

Though there were no differences in the pre-cystectomy TURBT histology results, there were significantly higher graded cancers in the ileal conduit group (G3 or more) compared to the neobladder group (12 *vs.* 0;  $P = 0.03$ ). There were also significantly higher staged tumours in the conduit group (pT3 or more) (24 *vs.* 2;  $P = 0.0004$ ), in addition to more node positive extensions in the ileal conduit group (N1) (13 *vs.* 0;  $P = 0.03$ ). Inversely, there were lower staged tumours in the neobladder group (pT2 or less) (22 *vs.* 16;  $P = 0.0006$ ). There were no distant metastases in any of the patients.

## Follow up and QoL

All patients were followed up with a mean of  $18 \pm 15$  months (range 1–60) post-operatively. There were no differences between the two groups regarding quality of life aspects such as acceptance, long-term complication/problems, psychological disturbance or sexual dysfunction. However, in total thirteen patients had progression of their disease and needed adjuvant treatment despite negative margins (1/24 in the neobladder group *vs.* 12/39 in the ileal conduit group;  $P = 0.03$ ). All the patients in the neobladder group retained their continence. No ileostomy/conduit complications occurred.

## Nerve-sparing data

There were no significant differences between both groups regarding erectile dysfunction (5/39 *vs.* 1/24;  $P = 0.28$ ), despite only three of our patients having nerve sparing surgery. All three have no erectile dysfunction.

## DISCUSSION

### Summary of main results

Though the debate is still out regarding which technique of urinary diversion is best, our study has shown that the only significant difference between the two groups that needs to be taken into consideration is the operative time. Due to the extra time needed to form the neobladder, longer operative times were observed. Furthermore, in our group of patients, the neobladder group had significantly more previous abdominal surgery done than the ileal conduit group. This too can attribute to a lengthier procedure rather than the straightforward 'virgin' abdomen. Nonetheless, we found no significant difference regarding demographics, TURBT histology, blood loss

or transfusion rates, conversion rates, lymph node yield, length of hospital stay, opiate requirement, or positive margins.

Though there were more intra-operative injuries in the ileal group, this did not reach statistical significance. Furthermore, there was no statistical significance regarding post-operative complications.

There were higher-grade cancers, higher staged disease, and more nodal positive results in the ileal group. This affirms that though patient impression and expectations are considered for type of urinary diversion, a 'hostile' looking resection intra-operatively ultimately determines the choice of either conduit or neobladder in our group of patients.

## Literature review

### Operative and postoperative comparison

A thorough search of the literature using the terms 'cystectomy', 'laparoscopic cystectomy', and the Mesh Phrase ("Cystectomy" [Mesh]) AND "Laparoscopy" [Mesh] yielded 1290 hits. Despite all these studies, there was no study published in the literature reporting on the comparison between ileal conduits and neobladder during laparoscopic cystectomy procedures.

To date, Huang et al. reported the largest series of LRC, however all their patients were neobladder procedures [6, 11]. Castillo et al., have the second largest series with 85 LRC (24 conduits, 42 neobladders, 10 Indiana pouches, 9 Mainz II pouches), followed by Cathelineau et al. with 84 LRC (33 conduits and 51 neobladders) and Sighniolfi et al. with 83 LRC (43 conduits and 26 neobladders) [4, 7, 11]. None of these studies compared the types of urinary diversions.

A recently updated Cochrane review on urinary diversion and bladder reconstruction following open cystectomy found no evidence to suggest that either bladder replacement or continent diversion was superior or inferior to conduit diversion [19].

Our data, though on a laparoscopic model of patients, also could not find any evidence to suggest one type of diversion is superior or inferior to the other. Although we did have statistically longer operative times in the neobladder group compared to the conduit group ( $P < 0.0001$ ), there were more patients in the neobladder group who had previous abdominal surgery ( $P = 0.02$ ). Therefore, we cannot deliberate to whether the operative time was longer due to the neobladder formation or due to operating on a previously operated-on abdomen causing a prolonged operation. None the less, no other significant difference was found between the two groups.

The World Health Organization (WHO) Consensus Conference on Bladder Cancer (CCBC) recommends

that the type of reconstruction is decided pre-operatively after patient counselling regarding the advantages and disadvantages of both methods [10]. The patient's age, general condition, tumour stage, and renal function must also be taken into consideration. However, the consensus could not deliberate on the type of diversion or choice of intestinal segment due to the lack of data available [10].

## COMPLICATIONS

Numerous studies have reported similar complications rates postoperatively between the conduit and neobladder groups during ORC [13, 15, 18, 21, 22]. We have found similar results with our LRC, with no difference in intra or post-operative complications. It is worth noting that no intra-operative complications occurred once the learning curve was surpassed. When compared to the initial cohort, this was statistically significant ( $P = 0.03$ ), emphasizing that once the learning curve is passed LRC is a safe procedure regardless of which urinary diversion technique is used.

### Quality of life

Similarly to other parameters, numerous studies have found no difference between the two groups regarding quality of life [12, 13, 15, 16, 18]. However, these comparisons are difficult to interpret, as there are inherently different sets of issues with each type of diversion. Conduits come with issues related to the stoma, appliance used, contact of urine with the skin causing irritation and excoriation, sexual dysfunction and psychological negative impact related to body image [13, 14, 16]. Neobladder issues are mainly related to urinary incontinence leading to psychological issues and the need for regular catheterisation [13, 14].

Hedgepeth et al. reported on the QoL comparison between the two groups and found no differences. However, they did note that the ileostomy patients returned to base line body image scores quicker than the neobladder group, while Sogni et al., found no difference in any of 22 different QoL parameter comparisons [18].

We found no differences between the two groups regarding acceptance, long-term complication/problems, psychological disturbance, sexual dysfunction, or incontinence.

We believe good counselling pre-operatively and establishing patient's expectations prior helps with the general acceptance of either procedure. This ratifies the recommendations made by the WHO-CCBC [10].

In a superficial overview of the literature, Autorino et al. reports that few differences were found between ileal conduits and neobladders, and that patients adapt to whichever procedure they have. They also ratify the need for patient education and decision participation during the pre-operative session [12].

### Strengths and limitations

This study is limited because it is not a randomised trial and the data, though entered into a database prospectively, was analysed retrospectively. Furthermore, we admit to a simplistic approach to the assessment of the QoL of the patients. Nonetheless, the information required was obtainable and comparable. Lastly, though our data is over five years, there is relatively a short follow-up period as far as cancers go (18 ±15 months).

Despite the limitations, this is the first comparison of ileal conduits to neobladder formation in a LRC cohort of patients.

### Implications for research

A powered cohort randomised trial is needed to establish which urinary diversion method is superior. This trial needs to include comparisons of patient's

demographics, pre, intra, and post-operative data, in addition to follow-up and QoL assessments.

### Implications for practice

Until such trial is conducted, no true difference can be appreciated between the two procedures. Our recommendation is that meticulous counselling of patients and their relatives should be done prior to the operation and a further shorter session pre-theatre. This will ensure that patients understand what to expect and how to deal with any complication, sequel, or causatum related to the procedure.

### CONCLUSIONS

This is the first comparative study of patients that underwent either ileal conduit or neobladder formation urinary diversion after laparoscopic radical cystectomy for muscle invasive bladder cancer. We found no conclusive differences between either types of diversion; however, affirmation of patient expectations and impression will affect the long-term quality of life.

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