

Initial Experience with Successful Totally Robotic Laparoscopic Cystoprostatectomy and Ileal Conduit Construction in Tetraplegic Patients: Report of Two Cases

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ABSTRACT

Purpose: To evaluate the feasibility and safety of totally robotic laparoscopic cystoprostatectomy for neurogenic bladder, with intracorporeal ileal-conduit urinary diversion in tetraplegic patients with severe neurogenic bladder complications.

Patients and Methods: Two men, 41 and 38 years old, with complete post-traumatic C7–C8 quadriplegia and poor lower urinary-tract condition underwent totally transperitoneally performed cystoprostatectomy and ileal-conduit urinary diversion with robotic assistance (Da Vinci®).

Results: The procedures were completed without open conversion. The total surgical time was 9.25 and 6.75 hours, respectively. There were no intraoperative complications. In the postoperative period, both patients had mild complications (pulmonary and urinary infections) that were treated successfully medically. The postoperative hospital stay was 13 days in both cases.

Conclusions: Our results demonstrate the safety and feasibility of robot-assisted laparoscopic cystoprostatectomy with ileal-conduit urinary diversion in two tetraplegic patients.

INTRODUCTION

NEUROGENIC BLADDER IN TETRAPLEGIC PATIENTS may be responsible for several complications, including recurrent urinary infections and progressive renal insufficiency. In these patients, the limited arm and hand mobility may impair clean intermittent self-catheterization, leaving them to obligatory permanent surveillance in order to avoid harm to the upper urinary tract.

Although conservative care is given from the beginning, some patients present with complications of intermittent catheterization such as difficult catheterization, recurrent infections, and progressive renal failure. With this in mind, others have proposed urinary diversion as a potential therapeutic option for these selected patients.¹ Because of the presence of diverse complications in the presence of a retained bladder, it has been accepted to perform concomitant cystectomy in the same procedure.^{2–4} The ileal conduit popularized by Bricker⁵ has been proved over time and could be an option for urinary

diversion in these patients. However, the invasiveness and morbidity of the procedure may limit its acceptance, with potential delay in treatment. Laparoscopy offers a less-invasive approach but is technically demanding because of imperfect hand-eye coordination, lack of depth perception, restriction of the instrument's degrees of freedom, and non-ergonomic positioning of the surgeon. It therefore requires a long learning curve.⁶ Nowadays, only a few centers master the performance of these complex procedures. This need has prompted us to investigate the feasibility of this procedure with the assistance of the robotic device, so that it may be offered earlier in the patient's disease course, before irreversible renal complications ensue.

We had recently reported on a robot-assisted urinary diversion created completely intracorporeally in a woman.⁷ Now, we report the feasibility and safety of the first two cases of laparoscopic cystoprostatectomy for neurogenic bladder with ileal-conduit urinary diversion performed completely endoscopically using the Da Vinci® (Intuitive Surgical, Sunnyvale, CA).

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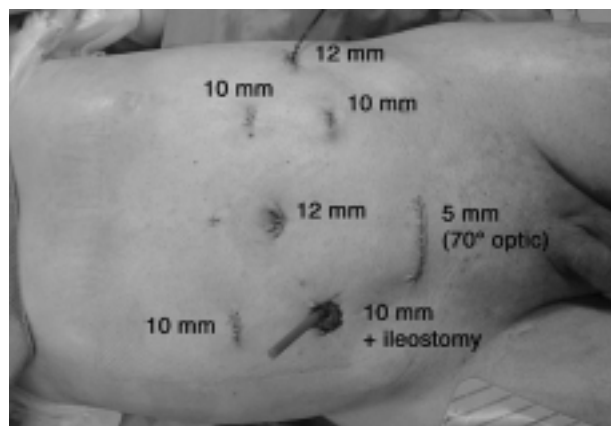


FIG. 1. Size and location of ports (postoperative view).

PATIENTS AND METHODS

Case reports

Two men, 41 and 37 years old, with complete post-traumatic C7–C8 quadriplegia for 4 and 5 years, respectively, and histo-

ries of bladder calculi were referred for recurrent urinary-tract infections associated with vesicoureteral reflux and upper-tract dilatation secondary to bladder overactivity in one and pathological postvoiding residual volumes in the other. Because of the impaired motor control of their arms, these patients were unable to perform clean intermittent urethral or continent-stoma self-catheterization. Conservative measures (intermittent catheterization by caregivers for both patients and associated anticholinergic therapy for 6 months in Patient 1) were instituted. Despite those actions, both patients continued to suffer multiple episodes of urinary-tract infection and recurrence of bladder calculi. This prompted us to consider a more aggressive treatment, and an ileal urinary conduit was considered the best option.

Neither of the patients had any contraindications to a laparoscopic approach. Patient 1 had undergone conventional appendectomy several years before. The previous bladder calculi extractions were done endoscopically in both cases.

After detailed informed consent was obtained, laparoscopic robot-assisted cystoprostatectomy with ileal-conduit urinary diversion was performed.

Surgical technique

The robotic system was positioned between the legs of the patients. Ports were placed transperitoneally with sizes and lo-

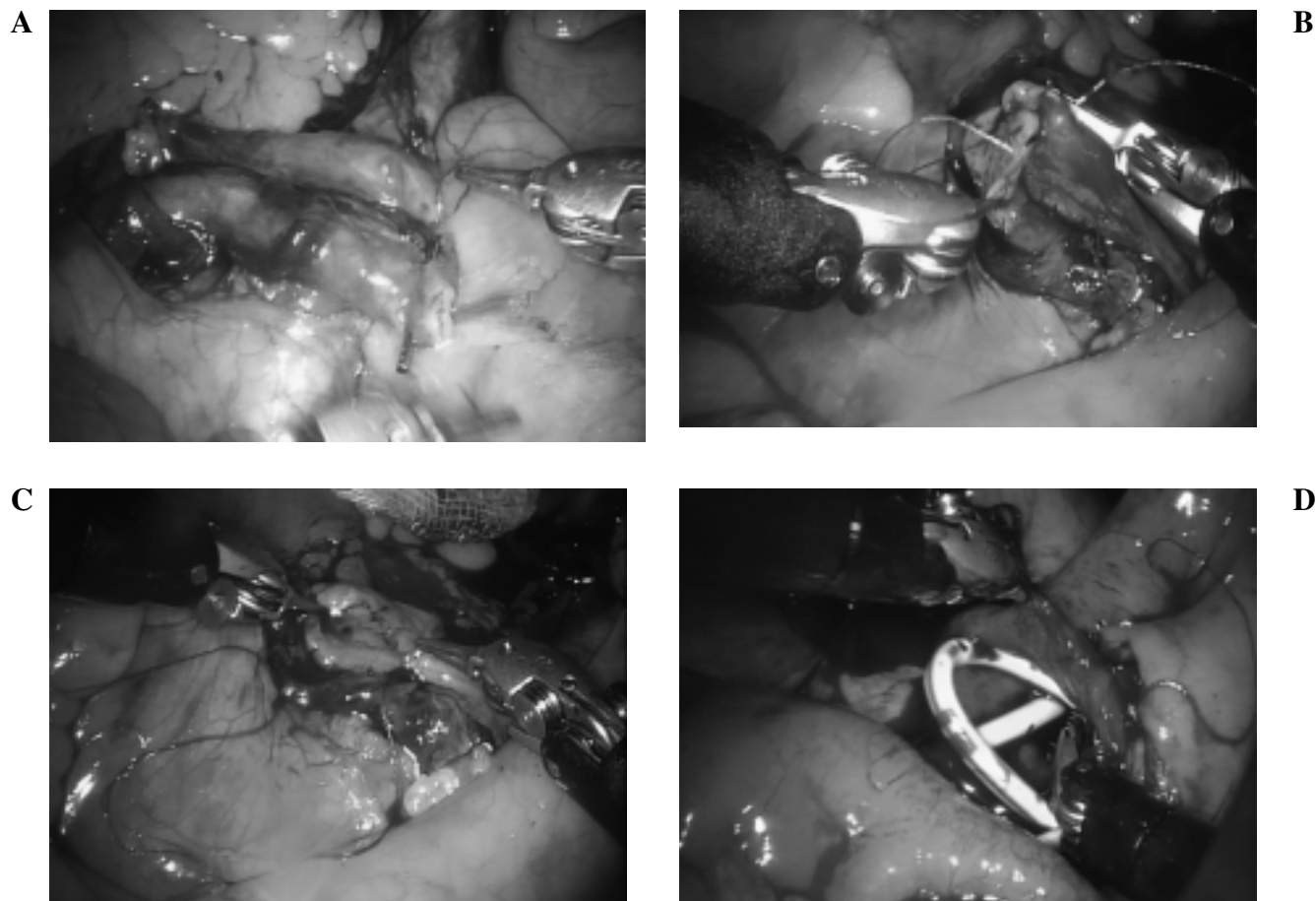


FIG. 2. Procedure for ureter. (A) Ureteral ends brought side to side in right iliac fossa. (B) Laterolateral anastomosis of spatulated ureters following Wallace technique (microforceps; 6/0 polyglycolic running suture). (C) Ureteral plate after completion of anastomosis. (D) Double-J stents in proximal part of ileal loop after completion of inferior aspect of ureteroileal anastomosis.



FIG. 3. Transillumination with 70° endoscope introduced through suprapubic port to delineate the mesentery vessels.

were placed in both ureters, and their inferior extremities were introduced into the proximal part of the ileal loop (Fig. 2D).

The ureteroileal anastomosis (proximal end of the ileal loop to the new ureteral plate) was completed with 6-0 polyglycolic running sutures. The parietal peritoneum was sutured around the base of the conduit to cover the urinary anastomosis with peritoneum. The distal part of the ileal loop was brought directly to the anterior wall and pulled out through the 12-mm port at the preoperatively selected ileostomy site corresponding to the previous inferior port placement used during cystectomy (Fig. 5). The distal ileum was then secured to the aponeurosis and to the skin. The specimen was retrieved through a small suprapubic Pfannenstiel incision.

RESULTS

Both procedures were completed without the need for open conversion. The main results are reported in Table 1. The ureteral stents were removed 1 month after surgery. Serum creatinine measurement and ultrasound examination were performed within 2 weeks after stent removal, demonstrating good renal function and drainage.

We reviewed the medical records of four female and two male paraplegic or tetraplegic patients who underwent suprapubic urinary diversion without cystectomy by the same team during the last 5 years using the traditional open approach. The mean operative time was 3.25 hours with a mean hospital stay of 17.6 days (range 13–23 days). All procedures were successful, and all patients had a standard recovery period. The postoperative follow-up was uneventful for the four female patients, with good long-term clinical results. Of the two male patients, one developed autonomic hyperreflexia and had to undergo a complementary robotic-assisted laparoscopic cystectomy; the second one presented with pyocystitis in the retained bladder and has been managed conservatively until now.

In our view, although these patients were not subjected to a concomitant cystectomy, their standard suprapubic urinary diversion procedure resulted in a longer hospital stay and more difficult postoperative course than the patients having the more extensive robot-assisted procedure.

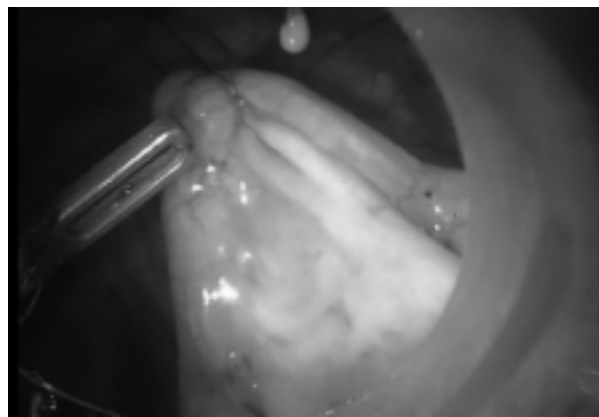


FIG. 4. Distal portion of ileal loop with transabdominal holding suture.

F1 cations as illustrated in Figure 1. Seven trocars were used: four of 10 mm for the robot arms (initially at the iliac fossa and then in a more cranial position, one of these at the right iliac fossa being used posteriorly for the ileostomy creation), one 12-mm umbilical trocar for the camera, one 12-mm trocar in the left flank for the assistant, and another 5-mm trocar at the suprapubic area for the 70° flexible cystoscope (future Pfannenstiel incision).

The radical cystectomy was performed first, using mainly bipolar forceps and an electrocautery hook, in the same way as described for invasive bladder cancer by Menon and colleagues⁸ except for omission of the bilateral pelvic lymphadenectomy. Subsequently, the ports were shifted 6 cm cranially, and the ileal conduit urinary diversion was created following the same technique described earlier by our team,⁷ the surgery being performed laparoscopically and totally robotically. During this portion of the procedure, two needle drivers were used for the robotic arms. Regular scissors (Ethicon Endosurgery, Cincinnati, OH), Endo-GIA stapler (Autosuture, Norwalk, CT), suction device (Porges-Mentor, Minneapolis, MN), and regular laparoscopic disposable graspers (Ethicon) were used by the assistant. No hand ports were applied.

Both ureters were dissected, clipped, and sectioned, with the left ureter passed through a window at the base of the mesosigmoid and the ends positioned on the right part of the sacral promontory (Fig. 2A). An ileal loop was isolated 15 cm from the ileocecal valve using an Endo-GIA stapler. A 70° cystoscope was introduced into the 5-mm suprapubic port in order to help identify the mesenteric vessels with transillumination (Fig. 3). Two transparietal holding sutures were applied on both extremities of the ileal loop in order to improve presentation and avoid any kinking (Fig. 4). The transversal mesenteric vessels were ligated with 3-0 sutures or coagulated with the bipolar forceps. Bowel continuity was restored using the Endo-GIA stapler. The mesenteric window was closed with a 3-0 running suture.

After a 3-cm longitudinal incision was made along the anterior aspect of the distal ends, the ureters were sutured (6-0 polyglycolic) side to side, following the Wallace technique⁹ (Fig. 2B,C). Double-J® stents (Bard Medical, Covington, GA)

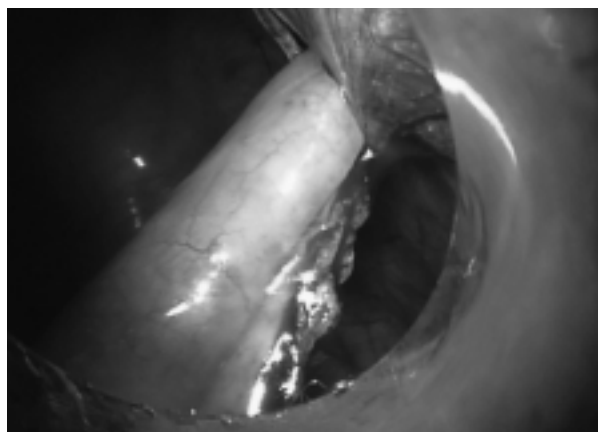


FIG. 5. Final view of ileal loop pulled through anterior abdominal wall.

DISCUSSION

The standard of care of patients with tetraplegia presenting with dysfunctional upper extremities and neurogenic bladder remains controversial. In general, conservative measures such as intermittent catheterization or utilization of an indwelling urethral catheter or a suprapubic catheter can be applied.¹⁰ In the presence of complications or noncompliance with those measures, more aggressive treatment may be instituted. The use of urinary diversion was initially described by Koziol and Hacker in 1975 in an attempt to preserve renal function.⁴ In a more recent series, this approach has also been addressed, showing that it should be considered only in selected cases.³

The use of minimally invasive techniques in the treatment of these patients was first proposed by Parra and colleagues,² who performed a laparoscopic cystectomy in 1992 in a tetraplegic patient with previous supravescical urinary diversion who presented with recurrent pyocystis. Their technique has showed good results with less morbidity than in other similar cases in which they used an open approach.²

Laparoscopic cystectomy with an extracorporeal ileal conduit was first reported by Sanchez de Badajoz and associates¹¹ for a 64-year-old patient with bladder cancer in 1995, but it was only

in 2000 that Gill and colleagues reported a laparoscopic cystoprostatectomy with intracorporeal ileal conduit in two cases.¹² Although it is a difficult procedure with a long learning curve, several centers have published their experiences in laparoscopic radical cystectomy showing a tendency to less postoperative pain and analgesic need, shorter ileus, and earlier enteral feeding.¹³ However, longer follow-up in trials comparing the conventional and laparoscopic approaches are still lacking.

With the advent of robotic surgery, the feasibility of cystoprostatectomy using this technology was demonstrated by Menon and colleagues in a series of 17 patients, with the urinary diversion being performed extracorporeally. The mean operative time was 4.5 to 5 hours with a reported blood loss of <150 mL.⁸

In completely laparoscopic cystectomies for bladder cancer with ileal-conduit urinary diversion, Gill and coworkers reported total surgical times of 11 hours 30 minutes and 10 hours for their two first cases.¹² The same procedure performed totally robotically was reported by Yohannes et al. with total procedure times of 10 hours and 12 hours for their two first cases.¹⁴ Similarly, Beecken and colleagues¹⁵ reported a total procedure time of 8 hours 30 minutes for their first case of robotic-assisted cystoprostatectomy with intracorporeal creation of an orthotopic neobladder.

Our overall surgical time in these high-risk patients was shorter than in these previous reports. This could be explained by the fact that there was no need to perform a lymphadenectomy and that the dissection was probably easier during the cystectomy because there was no oncologic risk if the organ was perforated. Increasing experience has allowed us to reduce the operative time, but 7.5 hours seems to be the median, as reported by Gill and associates in their third through seventh cases.¹²

An extracorporeal technique, as previously described,⁸ could be an option but has its limitations in the presence of a short mesentery or a wide abdominal wall that could prevent bowel exteriorization. This has prompted us to move toward the totally intracorporeal technique.

We began using the Da Vinci system in experimental surgery for a year, with different laparoscopic procedures first undertaken on pigs.¹⁶ Our clinical program began in November 2001, and since that time, we have used the robot for advanced laparoscopic surgery such as dismembered pyeloplasty,

TABLE 1. PERIOPERATIVE DATA

	Patient 1	Patient 2
Total surgical time (h)	9.25	6.75
Cart installation and trocar placement (min)	20	20
Cystectomy time (h)	3.75	3.8
Ileal conduit construction time (h)	4	2.5
Blood loss (mL) ^a	500	<100
Hemoglobin loss after 24 h (g/dL)	2	1.3
Time to oral intake (days)	4	3
Complications ^b	Pulmonary infection, urinary infection	Urinary infection
Postoperative hospital stay (days)	13	13

^aNo blood transfusions were administered.

^bResolved prior to discharge.

ureterolysis, nephrectomy for tumors or renal harvest from live donors, partial cystectomy, and, finally, cystoprostatectomy with ileal-conduit creation. The two cases described here were performed after 14 months of clinical experience. This confirms the rapid learning curve reported by others.⁸

CONCLUSION

Our experience confirms that ileal-conduit creation with cystoprostatectomy is feasible and can safely be performed by a laparoscopic totally robotic approach, providing these high-risk patients in need of a complex procedure with a minimally invasive option.

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Numbering of figs did not correspond to text. Also, we combined pictures of ureteral procedures. Please check for accuracy.