

Continence and Urodynamic Parameters: Comparison and Long Term Orthotopic Sigmoid and Ileal Neobladders

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Abstract: Objective: The of this study was to compare continence rates and urodynamics parameters among patients who had under gone orthotopic substitution with sigmoid or Ileal segments. Methods: After radical cystectomy for patients with invasive cancer bladder continent urinary reservoir was constructive in 110 patients. 40 patients received a sigmoid neoblader (SN) and 70 received an Ileal neoblader. Mean age was years for SN and year for IN. Post operative urodynamic evaluation was done after 18 and 36 months follow up period ranged from 3 to 10 years. Results: Clinically, frequency of micturation by day was less in the IN group (4-6 times/d), while in the SN group was (6-8 times/d). Day time continence was achieved in 95% of IN patients and in 90% of SN patients. While 85% IN patients and 65% of SN patients where continent by night respectively. Urodynamically the average reservoir capacity of the SN is (320 ml) was lower than the IN (536 ml) with filling pressure of 13 cm H₂O and 15 cm H₂O for the IN and SN group respectively. The majority of patients void by the Valsalva maneuver yet achieved good peek flow rates (SN group 17 ml/sec and IN group 15.5 ml/sec mean flow) with patients in both groups empty their reservoirs adequately with post void residual (PVR) less than 10% of the void volume. Conclusion: Completely detubularized sigmoid blader is functionally and urodynamically comparable to detubularized Ileal neoblader and it can be an adequate alternative for continent urinary diversion in case an Ileal segment cannot be used (eg. short mesentry). The higher incidents of night time urinary incontinence in the SN group could be explained by periods of high pressure due to neoblader contractions in combination with a relaxed sphincter during sleep plus the smaller functional capacity of the sigmoid neo blader.

Key words: Systectomy, orthotopic urinary diversion, Ileal neoblader, sigmoid neoblader, urodynamic evaluation, continence.

INTRODUCTION

Carcinoma of the urinary bladder is the most commonly encountered cancer in males in Egypt (El Bolkainy *et al* 1981). The standard treatment for the invasive tumor is radical cystectomy and urinary diversion (El Sebaie I & Zeigler J 1983). Orthotopic bladder substitution is presently the standard of care for diversion in selected population undergoing radical cystectomy and has substantially- enhanced the quality of life (Aboul Enein H & Ghoneim MA 2001). The ideal continent diversion has to fulfill 3 main features; it has to provide a capacious low pressure reservoir, an efficient continence mechanism & preservation of the upper urinary tract without obstruction or reflux (Ghoneim *et al* 1987). Different bowel segments have been used for construction of the neobladder with each segment has its advantages and disadvantages. Undoubtedly, major contributions to orthotopic bladder substitution were the studies of Kock *et al*, 1982, Lilien & Camey, 1984 and Ghoneim *et al*, 1987.

In this Study:

We describe and compare the functional & urodynamic properties of two different detubularized bowel segments most commonly used for reconstruction of neobladder; namely the ileum applying the Camey II technique (Camey, 1990) and the sigmoid pouch as described by Khalaf 1992 & Dapazzo *et al* 1994.

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MATERIALS AND METHODS

Between June 1997 & October 2004, one hundred and ten male patients with urinary bladder cancer underwent cystoprostatectomy and orthotopic urine diversion. Ileum was used in 70 patients utilizing Camey II procedure (Camey, 1990) while the completely detubularized sigmoid was used in 40 patients as described by Khalaf 1992 & Dapazzo *et al* 1994. The mean age was 57.7 years for the ileal group (range 43-71 years) and 56.5 years for the sigmoid group (range 39-72 years).

All patients were preoperatively submitted to thorough examination including mental condition, renal and liver function tests, urine bacteriology, intravenous urography (IVU), cystoscopy and biopsies from the tumor and other random sites including the bladder neck and prostatic urethra. For our study we chose patients with tumors T1 to T3N0M0; transitional or squamous or adenocarcinoma. Flexible sigmoidoscopy was done for all patients undergoing sigmoid pouch substitution to exclude any sigmoid tumors, ulcers or diverticulosis.

Technique:

Standard pelvic lymphadenectomy & cystoprostatectomy was carried out via transperitoneal approach, particular attention was paid to hemostasis of the dorsal venous complex, after section of the urethra 4 stay sutures of absorbable material were placed in the urethra.

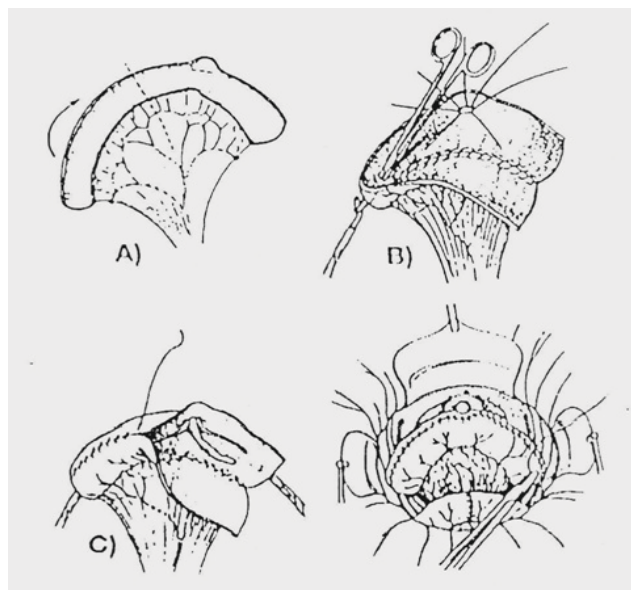


Fig. 1: Camey II Ileal Neobladder. (A) 50 cm ileal segment isolated & opened along its anti-mesenteric border, the incision curves towards the mesentery in the area marked for urethral anastomosis. (B) The ileum is folded as a transverse U & the medial borders are sutured. (C) The ileum is closed by folding the plate to complete pouch construction

In case of ileum the standard technique of Camey II was applied using a 50cm of ileum about 30cm proximal to the ileocaecal junction (Fig. 1). The mesentery was dissected to have enough length to reach the pelvis without tension. This segment was isolated & intestinal re-anastomosis was performed. The ileal segment was folded horizontally & the area for urethral anastomosis was marked. At the antimesenteric border the ileum was incised by diathermy knife but the incision curved towards the mesentery in the area marked for urethral anastomosis to form a plate like flap. The posterior walls of the ileum were sutured with 3/0 absorbable sutures. The ureters were anastomosed to the back of the neobladder via direct technique. A fingertip opening was made in the ileal plate marked previously and the urethra was anastomosed to the ileum with the 4 sutures previously positioned in the urethra. Pouch drainage was achieved by inserting 2 ureteric stents and a 24F suprapubic catheter through separate stabs in addition to a 22F urethral Silicon Foley catheter. The anterior edges of the ileal segment was then completely closed to form the new bladder.

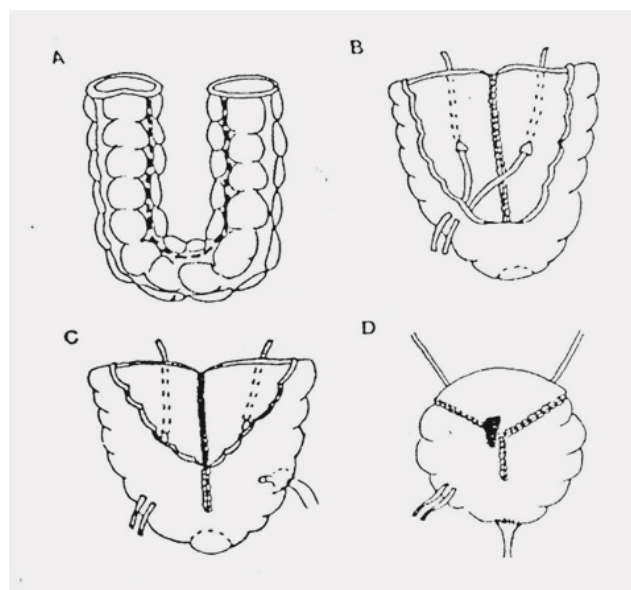


Fig. 2: Sigmoid Colon Neobladder. (A) 35cm of the sigmoid is isolated & positioned in U-shape. Complete detubularization along the medial taenia is performed. (B) The posterior edges are, realigned & sutured. The ureters are implanted in the posterior plate by submucosal tunnel (C) The anterior layer is sutured in Y-shape. (D) Final spherical configuration of neobladder.

In case of sigmoid pouch the sigmoid was mobilized and inspected and it must be ascertained that the sigmoid loop should be long enough to reach the urethral margin without tension, the sigmoid was divided transversely to give the U-shaped loop 35cm long (Fig. 2). Colonic continuity was achieved with two layers of continuous absorbable 3/0 sutures. Next, the sigmoid neobladder was fashioned after completely detubularizing the loop with diathermy knife along the medial taenia coli. The internal edges of the sigmoid were brought together giving a posterior plate. The ureters were also reimplanted via direct technique. The sigmoido-urethral anastomosis is then made starting by the posterior suture followed by the posterolateral, the anterolateral and lastly the anterior suture after passing a 22F Silicon Foley catheter. The anterior surface of the pouch was then closed in Y shape with the ureteric stents and a 24F suprapubic catheter being brought out separately after fixing to the adventitia of the neobladder.

In both groups, the ureteric stents were removed after 7-10 days, the suprapubic tube after 12-15 days while the urethral catheter was removed after 3 weeks. To all patients oral alkalinization was started one week after surgery using sodium bicarbonate.

Routine follow up of patients was done after 3 months then after 6 months then every 6 months thereafter, including clinical, laboratory (renal functions, urine bacteriology & serum electrolytes), radiological (abdominal & pelvic ultrasonography, chest X-ray, IVU & ascending and voiding pouchogram) and urodynamic evaluation (uroflowmetry, voiding pouchometry, pouch capacity and compliance with intrapouch pressure during filling and voiding and urethral pressure profile) was done at 6, 18 and 36 months.

Follow-up period for all patients ranged from 3 to 10 years.

RESULTS AND DISCUSSION

Results:

Our experience with the Camey II and sigmoid neobladder was satisfactory. Clinically, the frequency of micturition was less in the ileal neobladder group (IN) (4-6 times per day with mean of 4.78) than the sigmoid neobladder group (SN) (6-8 times per day with mean of 6.1). Day time continence was achieved in 95 % of IN patients and 90% of SN patients. Night continence was 85% in the ileal neobladder group versus 65% in sigmoid neobladder group. All patients gain night continence when they awake 1-2 times at night to empty their bladder (Table-1).

Table 1: Clinical data obtained in both groups after thirty six months postoperatively.

	Camey II	Detubularized
Day time	4 - 6 Times	6 - 8 times
Night Continence	85 %	65%

Table 2: Urodynamic data obtained in both groups after thirty six months postoperatively.

	Camey II	Detubularize
Mean Q-max	15.6 ml/sec	172 ml/sec
Filling Cystometry	13 cm.H ₂ O	15 cm. H ₂ O
Functional Capacity	536 ml	320 ml
Max. Closure	47.2	51.7 cm.

Urodynamic studies after 18 months (Table 2) showed a good flow rate in all patients with a mean Q max of 15.6 ml/sec in ileal group and 17.2 ml/sec in sigmoid group. Filling pouchometry revealed low pressure in both groups with a mean of 13 cm. H₂O in the ileal group and 15 cm. H₂O in the sigmoid group with no statistically significant difference. The mean capacity was 536 ml (range 450-600 ml) in the ileal group versus 320 ml (280-450 ml) in the sigmoid group. Residual urine was less than 100 ml in both groups; being 30-70 ml (mean 40 ml) in the ileal group and 15-35 ml (mean 20 ml) in the sigmoid group.

Urethral pressure profilometric study showed adequate maximal urethral closure pressure with mean of 47.2 cm.H₂O in the ileal group and 51.7 cm.H₂O in the sigmoid group, functional length with mean of 3.2 cm and 3.6 cm for the ileal and sigmoid groups respectively.

No pouch decompensation occurred in sigmoid group. Whereas decompensation occurred in 5 patients (7%) in the ileal group, occurring 12-16 months (mean 13.8 months) postoperatively. In these 5 patients the mean pouch capacity was 1600 ml (range 1370ml -1900ml) while the post-voiding residual urine was 260-350 ml (mean 290 ml). Two patients with ileal bladder decompensation also suffered ileo-urethral anastomosis stricture, which was solved endoscopically. These 5 patients were instructed to do self-catheterization at least once prior to sleep.

Discussion:

Orthotopic bladder substitution with an intestinal segment is an attractive option for reconstruction of the urinary tract after radical cystectomy. The neobladder constructed with a detubularized intestinal segment provides a low pressure and large capacity reservoir to protect the upper urinary tract and enables the patient to void through his own urethra. These advances in urinary diversion have been made in an effort to provide patients a more normal life style with a positive self-image following removal of the bladder (Abol Enein and Ghoneim 2001 ,Ghoneim *et al* 1987).

In this study we have obtained satisfactory functional results in 110 male patients undergoing orthotopic urine diversion after radical cystectomy. We utilized 2 detubularized bowel segments for total bladder replacement, namely ileum & sigmoid.

The ileum has been utilized for continent orthotopic diversion since 1979 by Camey and Le Duc. The simplicity of the procedure and the early satisfactory results regarding day continence (90%) were soon dampened by the high incidence of reflux, upper urinary tract deterioration & the marked nocturnal frequency. These were found to be mainly due to high intraluminal pressure (80 cm.H₂O or more). With the introduction of the concept of detubularization the technique was modified to the Camey II procedure which was associated with a good continence rate (daytime continence 90% and nocturnal continence 75%) in the series presented in 1990 by Camey. He reported the average pouch capacity as 450ml with mean pressure 17 cm. water.

In our study, comparable results were achieved regarding the Camey II pouch. 95% of patients were continent by day while 85% by night. Mean pouch capacity was 536 ml with a mean filling pressure 13 cm.H₂O.

The use of sigmoid colon for orthotopic bladder replacement was advocated by Reddy *et al.*, 1987 who described a partially detubularized sigmoid pouch. However the high reservoir pressures with its ill effects on the kidneys and high incontinence rate had lead other workers to utilize a fully detubularized sigmoid pouch as described by Khalaf, 1991 and Dapazzo *et al.*, 1994. In the later study, the authors reported that the mean pouch capacity was 480 ml with mean intrapouch pressure 18 cm.H₂O. They reported that all patients were continent by day while 67% by night.

In our study, comparable results were achieved utilizing the sigmoid pouch. 90% of patients were continent by day while 65% by night were comparable with results of Camey *et al* 1991, Hautmann *et al* 1999,

The debate is ongoing for refluxing versus non-refluxing uretero-ileal anastomosis. The proponents of non-refluxing anastomosis believe that orthotopic neobladders empty with high pressure as shown by urodynamic

studies (patients usually void by Crede or Valsalva maneuvers). This high pressure will result in ureteric reflux & thus deterioration of the upper urinary tract (Abol Enein and Ghoneim 2001, Ghoneim *et al* 1987, Studer *et al* 1995). The opponents of non-refluxing anastomosis believe that the ureter is subjected from outside to the same high pressure inside the pouch during valsalva maneuver which reduces the reflux beside, the incidence of uretero-ileal strictures is higher in non-refluxing anastomosis and that- reflux has no clinical significance in the upper urinary tract (Antuck *et al* 2000, Wishahi *et al* 2000).

The progressive increase in pouch capacity occurred to all our patients (maturation of the pouch) but decompensation with increased residual urine (mean 290ml) occurred in 5 patients of the ileal group two of them was due to infra-pouch strictures which were managed endoscopically. The other 2 patients had no definite cause. This issue had been urodynamically evaluated by Koraitam *et al*, 1995 who reported that over-distension of the pouch due to the absence of a definite and compelling sensation of a full bladder is the most important underlying cause of progressive increase in neobladder capacity with time. To avoid over-distension they advised that all patients should void by the clock. They also reported that only the sigmoid colon has its nerve supply from the same sacral segments of the spinal cord as the bladder and therefore it can substitute for the sensitive function of the bladder wall.

Conclusion:

We believe that good functional voiding outcomes are obtained with radical cystectomy and orthotopic bladder reconstruction. Comparable results were achieved with use of either detubularized sigmoid pouch or Camey II ileal pouch as long as principles of preservation of the periurethral sphincteric muscle and construction of an adequate capacity and low-pressure reservoir are maintained. The main advantages of Camey II ileal neobladder is that it can accommodate a larger urine volume at a lower pressure when compared to detubularized sigmoid neobladder. The higher incidence of night time urinary incontinence in the sigmoid group could be explained by periods of high pressure due to neobladder contractions in combination with relaxed sphincters during sleep in addition to the smaller functional capacity of the sigmoid neobladder. However, completely detubularized sigmoid neobladder can be considered as an adequate alternative to perform continent orthotopic urinary diversion especially in patients with short mesentery of ileum. Yet it should be considered that the sigmoid colon is often affected with diverticulosis and malignancy that make it less ideal for long-term diversion in younger patients.

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