

## Use of Bowels in Urological Reconstructive Procedures – A Single Center Experience in a Tertiary Care Hospital

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**Abstract:** Introduction: Bowels are frequently used in reconstructive urology for ureteral substitution, bladder augmentation and urinary bladder replacement done for various indications.

**Materials and methods:** A prospective study of incorporation of bowel segments in various urological procedures was done in King George Hospital, Visakhapatnam between August 2009 and March 2012

**Results:** Total number of 40 patients were studied for whom bowel segments were used for various indications. Patient age group 24 to 67 years included. Out of 40 cases, 21 cases were done after cystectomy for benign and malignant causes. In 10 cases Mitrofanoff procedure was done for failed stricture urethra. Augmentation cystoplasty was done in 6 cases of tuberculous bladder disease. Ileal ureter replacement was done in 3 cases.

**Conclusion:** Usage of bowels in various urological procedures is proved to be safe and effective with minimal morbidity and mortality.

**Keywords:** ureterosigmoidostomy, augmentation cystoplasty, Mitrofanoff appendicovesicostomy, ureterocolonic anastomosis.

### I. Introduction

Bowel is frequently used in reconstructive urological surgery for ureteral substitution, bladder augmentation and bladder replacement done for various indications. Management and care must be tailored according to individual needs. General goals of reconstruction are to protect renal function, minimize infection, and maximize social acceptability. For some patients normal voiding may be a real possibility. However, when not possible, intermittent catheterization may be the next best alternative and may result in dry patients. A clear individualized plan for reconstruction and care must be formulated to fit the particular clinical situation. Before any surgery this plan is presented to the patient and family. The technically best reconstruction in the world is a failure if the patient and support systems cannot comply with the therapeutic plans.

### II. Materials And Methods

A prospective study of incorporation of bowel segments in various urological procedures done in our institute between August 2009 and March 2012 was done. All the patients were followed regularly. Ultrasound abdomen was done at 6 weeks, 6 months and 1 year after surgery. Serum creatinine, blood urea and serum electrolytes measured at each visit.

The present study included 40 cases where bowel segments were used for various indications. Their age at operation ranged from 24 to 67 years (mean 55 years). Out of the 40 cases, 21 were done after cystectomy for benign and malignant causes. Urinary diversion was done by ureterosigmoidostomy, ileal conduit diversion and continent urinary diversion (Indiana pouch). 10 cases where Mitrofanoff procedure was done for failed stricture urethra. Augmentation cystoplasty was done in 6 cases of tuberculous bladder disease. Ileal ureter replacement was done in 3 cases. We performed 16 cases of Ureterosigmoidostomy reconstruction using double folded recto sigmoid pouch after cystectomy. Out of 16 patients, thirteen were done for carcinoma bladder after radical cystectomy, two were patient with extrophy of bladder and one case is extrophy of bladder with carcinoma. Male of female ratio in these patients is 9:1; all the patients are in the age group of 15-50 yrs, All the patients were evaluated with Hb, Tc, Dc, ESR, Renal profile, Liver function tests, complete urine examination, Urine culture & sensitivity, chest x-ray, USG abdomen and CECT abdomen. Pre operatively in all cases assessment of anal sphincter competence and Lower GI endoscopy was done. Counseling regarding risk & benefits of internal diversion explained to all the patients. Mechanical bowel preparation was performed in the usual manner, and all patients received prophylactic antibiotic treatment during the perioperative period. Double folded rectosigmoid bladder with serous lined extramural ureterocolonic anastomosis (Abol-Enein & Ghoneim) ureterosigmoidostomy was formed in all cases indicated. Procedure was easy to perform, pouch capacity was good and easier technique of reimplantation complications (short term follow up) and better continence rates.

All cases post operatively managed by nil per oral, Nasogastric tube aspiration, Intravenous fluids, Maintenance of electrolyte balance, Antibiotics, Analgesics, Irrigation of flatus tube with normal saline. All the cases were followed for a period of 2 to 26 months, NO deaths were recorded. Early post-op complications

were Wound infection in 4cases, Prolonged ileus in 2, Electrolyte imbalance (hypokalemia,acidosis )in 3and Anastamotic leak requiring re exploration and anastomosis in 2 patients.

Late complications noticed were pyelonephritis in 4 patients and hyperchloremic metabolicacidosis in 4patients.We advocatedlongterm antibiotic prophylaxis, alkalinizing agents (potassium citrate & citric acid solution ), tab nicotinic acid 400mg TID, vitamin-D and calcium were given. Night time rectal tube advised for all patients.All patients were continent for 3-4 hrs during day time and two patients complained night time faecaluria (mild).

We performed 4 cases of conduit diversion. Ileal conduit was done for carcinoma bladder after radical cystectomy and the other were transverse colon conduit and sigmoid colon conduit done for Radiation cystitis. A full mechanical and antibiotic bowel preparation was done in all cases. Midline transperitoneal approach preferred. For ileal conduit, a segment 10 to 15cm in length is selected 10 to 15cm from the ileocecal valve. The isolated ileal segment is placed caudad, and an ileoileostomy is performed, right ureter and left ureter isolated and anastomosis was done to isolated ileal segment in antiperistaltic manner by Wallace technique. Ileal stoma is placed in right iliac fossa at pre operatively marked stoma site.

Transverse colon conduit was done based on middle colic arteries, 15cm segment is isolated between bowel clamps, and a two-layer colocolostomywas performed. The segment is placed caudad to the anastomosis. The ureterocolic anastomoses are then performed by Wallace technique and is anchored to the retroperitoneum close to the midline. The stoma is usually placed in the left upper quadrant. Sigmoid colon conduit was performed in 2 cases where the sigmoid colon is freed of all peritoneal attachments. 15cm segment is isolated and placed laterally. Bowel continuity is restored and the mesenteric window closed. The ureters were anastomosed to the colon by lead Better- Clark technique and stented.

All cases post operatively managed by catheterization of conduit with 18fr Foley catheter, nil per oral, naso gastric tube aspiration, intravenous fluids, maintenance of electrolyte balance, antibiotics, analgesics. Catheter in the conduit is removed on 2<sup>nd</sup> post-op day and ostomy bag was connected, drain removed when output is less than 50ml, stents were removed after 7<sup>th</sup> post op day. Continent urinary diversion by Indiana pouch technique was done after radical cystectomy in one case but the patient had bowel leak and died with sepsis. Mitrofanoff procedure was performed in 10 patients. Out of 10, eight patients are stricture cripples with failed recurrent irreparable urethral strictures after traumatic posterior urethral injuries. Two are female patients with obstetric labour injury complex with bladder neck contracture and urethral loss.

All the 8 patients are on permanent SPC, and would remain on SPC if the Mitrofanoff procedure is not performed. If at all the procedure fails, the patient will be on SPC and there will be no harm to the patient.

The eight stricture cripple underwent surgeries twice or more with recurrent irreparable strictures due to lengthy defects and previous infections with sinuses in the perineum.

The two female patients had bladder neck contracture and total urethral loss following prolonged obstructive labour. One patient delivered normally and went into retention of urine in the immediate post partum period. The other patient underwent LSCS and is in retention of urine in the immediate post operative period. For both the patients SPC was done immediately. At the time of Mitrofanoff procedure all the patients are on SPC.

All the patients are intelligent enough to participate in the post operative self catheterization programme, as the success of this procedure depends on clean intermittent catheterization. Appendix is used as a conduit in all the patients and the appendix is of sufficient caliber and long enough to perform appendicovesicovesicostomy. Even though umbilical stoma appears to be cosmetically good, we selected right lower quadrant to construct stoma because it is technically less demanding. It is easy to bring the appendix to the right lower quadrant of the abdomen.Preoperatively bowel is prepared by both antibiotic and mechanical bowel preparation. Stomal site is selected preoperatively with the patient both standing and supine positions

Abdomen is opened by lower midline incision .Appendix is checked for its caliber, mobility and absence of inflammation. Bladder is checked for its mobility to reach the anterior abdominal wall. Appendix is mobilized with appendicular artery in the mesoappendix and caecal cuff. Appendix is reversed in the direction to keep the caecal cuff as abdominal stoma to prevent stomal stenosis. Bladder is anchored to the parities. A 10 Fr feeding tube is kept as a stent for 3 weeks. Bladder is closed in 2 layers after performing a SPC.

Postoperatively, the feeding tube stent is removed after 3 weeks. Patient is taught about CIC. SPC is removed after the patient is confident of doing CIC.Three cases of ileal ureter were done, two were done for multiple and lengthy stricture of ureter and the other was a case of ureteric avulsion during ureteroscopy.A full mechanical and antibiotic bowel preparation is often used except for the ureteric avulsion case where an emeganyileal ureter replacement was done. A long midline incision is made. The ipsilateral colon is mobilized medially, and the affected ureter is dissected proximally to the level of healthy tissue. The length of the ureteral defect is measured, and an appropriate segment of distal ileum is chosen. The segment should be at least 15cm away from the ileocecalvalve, and adequate blood supply should be confirmed before harvesting. The mesentery is usually divided more extensively than with a standard ileal conduit to provide greater mobility. The proximal

anastomosis performed at the level of the renal pelvis as the entire upper ureter is unhealthy and distal ureter is anastomosed (refluxing) to the bladder.

The patients were followed postoperatively with nephrostogram at 3 weeks and serum electrolytes were done at regular intervals. All patients had increased mucus production in early post operative period and were advised to have bladder wash regularly. We performed six cases of augmentation cystoplasty during 2009 to 2012, all were done for tuberculous bladder involvement with bladder capacity below 100ml. Out of six cases sigmoid cystoplasty done in 5 and in 1 case gastrocystoplasty was done.

The initial approach to patient for augmentation cystoplasty is similar regardless of the bowel segment to be used. Cystoscopy was performed preoperatively to identify any unsuspected anatomic abnormalities that may affect the surgery or postoperative care. If other bladder procedures, such as ureteral reimplantation, are to be performed, the bladder is left full after cystoscopy. A midline incision is preferred, for gastrocystoplasty, the incision needs to extend from the pubis to xiphoid to allow more cephalad exposure.

For Sigmoid cystoplasty, Fifteen to 20cm of sigmoid colon is identified and mobilized. The mesentery is transilluminated to identify the vascular arcade to the segment and ensured that the segment can reach the bladder without tension. The bowel segment is divided between clamps and a colocolostomy performed. The remainder of the abdominal cavity is carefully packed to prevent contamination from the open sigmoid segment. Detubularization and reconfiguration are done. The sigmoid patch is anastomosed to the bivalved bladder. Ureteric reimplantation done in two cases with lower ureteric strictures. A large suprapubic tube is brought out through the native bladder and secured to the bladder and skin exit sites. Drains are placed.

A gastric wedge based on the midportion of the greater curvature may be used. The right or left gastroepiploic artery may be used as a vascular pedicle to used. The wedge –shaped segment of stomach includes both the anterior and posterior wall. The segment used may be 10 to 20cm along the greater curvature, depending on the patient's age and size as well as the needed volume. The native stomach is closed in two layers with interrupted silk sutures on the outer seromuscular layer. The segment and pedicle may be passed through windows in the transverse mesocolon and mesentery of the distal ileum and carefully secured to the posterior peritoneum and sutured to the bivalved bladder.

All the cases in the early post operative period are managed with nasogastric decompression until bowel function recovers, including patients after gastrocystoplasty. Attention to fluid and electrolyte management, and Continuous drainage of the bladder is achieved by suprapubic cystostomy. The suprapubic tube should be irrigated at least three times daily and whenever drainage is slowed by mucus. Extravesical drains were removed after fifth day, if drainage of urine is not apparent. A cystogram done at 3 weeks, all patients begin on clean intermittent catheterization every 2 to 3 hours during the day and one or two times at night after bladder healing is documented. The suprapubic tube is removed after catheterization is successfully under way and well tolerated. The duration between catheterizations is gradually increased during several weeks to 4 to 5 hours during the day. In All patients postvoid residual volumes were checked and advised to continue catheterizations if the residuals are significant.

Follow up was done in all cases, Routine radiographic surveillance of the upper urinary tract is indicated at 6 weeks, 6 months, 1 year and year thereafter. Serum electrolyte, blood urea nitrogen, and creatinine determinations along with urine cultures are performed monthly in the first year after surgery.

One patient who underwent gastrocystoplasty conceived and her antenatal and postnatal periods were uneventful except for mild increased frequency. This patient had increased serum creatinine after 2 years of pregnancy to 2 mg/dl, as she stopped doing CIC.

### III. Results

Fort patients were included; they were 32 males and 8 females with a ratio of 3:5:1. Median patient age at surgery was 55 years (range 24 to 67 years), and the median follow-up was 18 months (range 3 to 34).

Impact of age at surgery on the rate of early & long term complications

**Table 1**

Age at surgery	No. of Patients	No. of Complications%
30 or younger	8	5
30-40	7	11
40-50	5	17
50-60	16	68
60 or older	4	90

Invasive bladder cancer was the major indication for use of bowel in all enrolled cases. Complications occurred in 20 (50%) patients; more than one complication was recorded in the same patient. Urine leak, prolonged ileus, wound infection, mucus in urine were problems in early post op period and usually resolve with time.

**Complications Of Various Types Of Bowel Incorporation**

**Table 2**

Complications	Type of Surgery	No. of patients Complications / Total no. of patients
Bowel leak	Ureterosigmoidostomy	2/16
	Conduit diversions	1/4
	Indiana pouch	1/1
Urine leak	Ureterosigmoidostomy	6/16
	Conduit diversions	1/4
	Indiana pouch	1/1
	Augmentation Cystoplasty	3/6
Stoma related	Mitrofanoff procedure	4/10
	Conduit diversions	2/4
Uretero intestinal obstruction.	Nil	Nil
Acidosis requiring Treatment	Ureterosigmoidostomy	4/16
	Augmentation Cystoplasty	1/6
Pyelonephritis	Ureterosigmoidostomy	4/16
Renal deterioration	Augmentation Cystoplasty	1/6

**Urine leak:** common complication but was only a temporary problem. Usually resolves on 3<sup>rd</sup> post op day in almost all the patients

**Bowel related complications:** Were reported in 4 (10%) patients after a median of 12 months (range 3 to 34). Bowel leak developed in 4 cases (2 after ureterosigmoidostomy, 1 after ileal conduit and the other after Indiana pouch) and obstruction developed in 1 patient, both required surgical re-intervention. Six patients reported intermittent diarrhea after ureterosigmoidostomy.

**Metabolic and nutritional disorders:** Hyperchloremic acidosis was observed in 4 patients who undergo ureterosigmoidostomy and 1 patient with augmentation cystoplasty. All were managed with fluid replacement and administration of alkalinizing agents or blockers of chloride transport.

**Stoma related complication:** Stoma related problems developed in 6 (60%) patients stenosis in 4 cases of appendicovesicostomy. Surgical intervention (stoma revision) was done in 2 cases and dilation of stoma done in 2 cases. Stomal prolapsed with skin irritation in two patients after conduit diversion.

**Urinary tract infection and pyelonephritis:** Asymptomatic bacteriuria was not investigated in our cases; as routine urine culture is not part of our regular follow-up, only symptomatic urinary tract infections and/or pyelonephritis requiring hospitalization were investigated. The latter complication was observed in 4(31.2%) patients after ureterosigmoidostomy. Median time between surgery and the first episode of urinary tract infection was 14 months.

**Conduit / ureteral anastomosis:** Break down of ureteroilealanastomosis (Wallace) developed in 1 patient after ileal conduit.

**Urolithiasis:** Vesical calculus developed in 1 (10%) patients after mitrofanoff procedure. Cystolithotripsy was done via appendicovesicostomy.

**Renal function deterioration:** Renal deterioration was observed in 1 (18%) patient 2 years after augmentation cystoplasty (gastrocystoplasty). As the patient was lost for follow up and was not doing CIC regularly. The most common complication observed was mild hydronephrosis that usually subsides with follow up. The incidence of complications was increasing with increasing the follow up period. The patterns of complications were different during follow-up period and varies with bowel segment used. Bowel related complications were mainly observed during early follow-up (within the first 6 months to 1 years), while stoma and renal functions related complications were observed later (between 1 and 3 years). Morphological changes, urolithiasis and carcinoma were late complications may observed later mainly after 5 years of follow up. Surgical re-intervention was needed for complication in 8 patients (20%).

**Table 3** surgical intervention after bowel incorporation

Complication	No of patients	Surgical intervention
Bowel leak	4	Laprotomy & repair
Stomal related	2	Refashioning of stoma
Bowel Obstruction	1	Laparotomy & repair
Urolithiasis (vesical calculus After mitrofanoff	1	Cystolithotripsy via appendicovesicostomy

#### IV. Discussion

Use of bowels in urology is common, variety of bowel segments were incorporated in different surgeries performed for various indications. In our institute we use bowel for Urinary diversion, Mitrofanoff appendicovesicostomy, Augmentation cystoplasty and Ileal ureter replacement. In all cases we performed routine investigations, counseling regarding risks & benefits of incorporation of bowel segment explained to the patients. Mechanical bowel preparation was performed in the usual manner, and all patients received prophylactic antibiotic treatment during the perioperative period.

For patients with carcinoma bladder we routinely use Double folded rectosigmoid bladder with serous lined extramural ureterocolonic anastomosis (Abol-Enein & Ghoneim) ureterosigmoidostomy. The Procedure was easy to perform, pouch capacity was good and easier technique of reimplantation even in dilated ureters. We prefer to use ureterosigmoidostomy over ileal ureter due to economic constrains, reluctance of patients to have a stoma and due to non availability of urostomy bags in areas remote from our hospitals.

All the cases were followed for a period of 2 to 34 months. All patients have better post operative convalescence and less post-op complications (short term follow up) and better continence rates. No deaths were recorded. In our own experience, most patients who have ureterosigmoidostomy live as well as or better than those with cutaneous diversion. Certainly, the quality of life differs. They enjoy a nearly normal life and body image. This is particularly true of younger people, who dislike ostomy on the abdomen, as is required in cutaneous urinary diversion.

All patients who have ureterosigmoidostomy must be watched closely for problems associated with pyelonephritis and hyperchloremic acidosis. We are very sensitive to and aware of the complications of ureterosigmoidostomy. All these patients are maintained on a low sodium chloride diet to reduce their chloride intake and avoid "chloride acidosis." They must be given extra base to make up for this. That is accomplished by giving them sodium potassium citrate (sodium citrate 5gm. Potassium citrate 5gm/100ml. That is a 10% solution). They usually take about 30ml. of this at least once and sometimes twice a day. Tab nicotinic acid 400mg TID, vitamin-D and calcium were given. We advocated long term antibiotic prophylaxis and night time rectal tube for all patients. Mitrofanoff procedure enjoys the single feature of affording a catheterizable continent diversion using appendix that can be performed utilizing techniques already in the urological armamentarium. Appendicovesicostomy can be performed relatively easily and less time taking. The patients can get rid of permanent SPC and can lead near normal life. To achieve satisfactory results, careful patient selection is essential. It is desirable to have highly motivated patient with realistic expectations and normal intelligence, who are physically and emotionally capable of dealing with strict regimen of CIC so as not to jeopardize the entire procedure.

Bladder augmentation with GI tissue is an important tool in the armamentarium of the urologist in the management of patients with tuberculous bladder with capacity less than 100ml. The goal of augmentation is to create a reservoir with an adequate functional capacity with a low end-filling pressure. By achieving this, the low intravesical pressure will not interfere with ureteral delivery of the urine to the bladder and preserve the upper urinary tract from high pressure damage by vesico-ureteral reflux. Augmentation will alleviate symptoms associated with decreased bladder capacity.

The ideal bowel segment for enterocystoplasty remains controversial. We commonly use sigmoid colon in view of complication rate comparable with that of ileocystoplasty performed in other centers. Gastrocystoplast was done in 1 case with mildly increased serum creatinine and the patients are doing well. Ileal conduit is easy to make, time taken is less and is easily managed postoperatively. Preoperative counseling is the most important part. Acceptance of stoma and maintenance of urostomy is difficult in uneducated patients. Economical issues are also equally important as patient need to buy ostomy bags. Ileal conduit is an ideal choice of diversion for well motivated and educated patients.

Ileal replacement for ureteral reconstruction remains excellent solution for an obstructed ureter when other reconstructive measures from within the urinary tract are judged to be impossible. The main advantage of reconstructing the ureter with ileum is the long-term avoidance of nephrostomy tubes, ureteral stents and nephrectomy. Furthermore, the ileal ureter requires no external devices, preserves renal function. If the selected patients have good renal function preoperatively, the risk of worsening uremia and hyperchloremic metabolic acidosis is low. Overall almost all of the patients in our series had improved or stable serum creatinine. Furthermore, we caution against using an ileal ureter in patients with renal impairment preoperatively.

## V. Conclusion

Various segments of bowel were advocated in different urological surgeries with minimal complications. Mechanical bowel preparation, perioperative antibiotics and fine suturing techniques lead to decrease in complication rate. For patients with carcinoma bladder we prefer to use double folded rectosigmoid pouch with serous lined extramural ureterocolonic anastomosis (Abol-Enein & Ghoneim) ureterosigmoidostomy due to economic perspective, ease of implantation even in dilated ureters, less incidence of pyelonephritis and compliance of the patients postoperatively. Ileal conduit is an ideal choice of diversion for well motivated and educated patients. Appendicovesicostomy can be performed relatively easily, less time taking in patients with recurrent failed stricture urethra repairs and can get rid of permanent SPC and can lead near normal life. Augmentation cystoplasty offers a successful long-term solution for patients with small contracted bladder (capacity <100ml), causing bothersome symptoms - a sequelae of genitourinary tuberculosis. It improves symptoms, prevents renal deterioration and if done for proper indications, the procedure is well tolerated resulting in gratifying long-term outcomes. Ileal ureter replacement is a technically feasible surgery to be performed in any patient requiring ureteral reconstruction despite a normal contralateral kidney. As such, it is a better alternative than nephrectomy in cases of complex and multiple ureteral strictures. It portends good long-term results for the relief of obstructive uropathy and the preservation of renal function. The associated complications and morbidity of ureteral replacement should be considered in patient selection. The long-term benefits should compare favorably to short-term morbidity.

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