“Spiral-Cap” ileocystoplasty for bladder augmentation and ureteric reimplant

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Abstract

Objective: To demonstrate the new technique of Spiral-cap ileocystoplasty for bladder augmentation and simultaneous ureteric reimplant.

Materials and Methods: Seven patients with small capacity bladder and simultaneous lower ureteric involvement operated in single tertiary care institute over the last 5 years were included in this study. Spiral-cap ileocystoplasty was used in all the patients for bladder augmentation. Proximal part of the same ileal loop was used in isoperistaltic manner for ureteric reimplantation. Distal end of this ileal loop was intussuscepted into the pouch to decrease the incidence of reflux. Detubularized distal portion of the loop was reconfigured in spiral manner to augment the native bladder. Patients were analyzed for upper tract changes, serum creatinine, bladder capacity, and requirement of clean intermittent self-catheterization in follow-up over 5 years.

Results: There was no evidence of any urinary or bowel leak in the postoperative period. Recovery was equivalent with those treated with other methods of bladder augmentation. Follow-up ultrasonography showed good capacity bladder. Upper tracts were well preserved in follow-up. Urinary bladder and lower ureter pathologies were addressed simultaneously.

Conclusion: Spiral-cap ileocystoplasty is a useful technique in patients who require simultaneous bladder augmentation and ureteric reimplant.

Key Words: Bladder augmentation, genitourinary tuberculosis, ileocystoplasty, spiral-cap, ureteric reimplant

INTRODUCTION

Augmentation cystoplasty is a technique of augmenting the urinary bladder capacity in patients with small capacity bladder.[1] Ileocystoplasty is the procedure of augmentation of bladder with ileal segment. We describe a new technique of “Spiral-cap” ileocystoplasty for bladder augmentation and ureteric reimplant, wherein simultaneous bladder and lower ureteric pathologies such as stricture and/or reflux can be dealt with using the same ileal loop which is used to augment the bladder in isoperistaltic manner for lower ureteric substitution.

Access this article online

Quick Response Code: 
Website: www.urologyannals.com
DOI: 10.4103/0974-7796.192087

How to cite this article: Sawant SA, Tamhankar AS, Kumar V, Prakash WP, Gaurav VK, Bansal S. “Spiral-Cap” ileocystoplasty for bladder augmentation and ureteric reimplant. Urol Ann 2016;8:464-7.
MATERIALS AND METHODS

Over a period of 5 years, a total of seven patients [Table 1] were operated for spiral-cap ileocystoplasty. Patients included for this procedure were having reduced bladder capacity (<150 cc) along with lower ureteric pathology due to the disease process. Patients with nadir serum creatinine level of more than 2 mg/dl were excluded from this treatment modality. As our center is a tertiary referral center for urological services, we get many patients with genitourinary tuberculosis. Six of our patients had genitourinary tuberculosis with lower ureteric strictures. Three of them had bilateral ureteric strictures, and two had unilateral stricture with contralateral ureteric reflux. One patient had isolated right side ureteric stricture. These patients also had reduced bladder capacity varying approximately from 50 to 150 cc due to the disease process. Patients presented initially with storage lower tract symptoms and raised serum creatinine due to upper tract dilatation because of ureteric involvement and reduced bladder capacity. External diversion in the form of nephrostomy was considered in them. Patients of tuberculosis were started on antituberculosis treatment. All patients had nadir levels of serum creatinine of <2 mg/dl. Glomerular filtration rate (GFR) was estimated with radionuclide scans after attaining nadir serum creatinine. Voiding cystourethrogram was done to evaluate for reflux. Nephrotomogram was done in cases whenever reflux was not seen and stricture was suspected. Definitive surgery was planned after 4 months of starting with antituberculosis therapy when the disease process had become quiescent. All patients were operated by spiral-cap ileocystoplasty and ureters (unilateral or bilateral) were reimplemented in the proximal ileal loop. Patients were followed up with serum creatinine, GFR, electrolytes, acid-base status, and the requirement of clean intermittent catheterization (CIC) and bladder capacity by ultrasonography with maximum follow-up till 5 years.

The technique used for spiral-cap ileocystoplasty was as following.

All patients were given bowel preparation before surgery. Lower midline incision was used for exploration. Bladder was opened in sagittal plane. Depending on the native bladder capacity, length of terminal ileum to be taken was tailored from 20 to 40 cm. Bowel continuity was restored by end-to-end ileocolonic anastomosis. Proximal 8–10 cm of ileal segment was kept intact as ileal chimney, and rest of ileal loop was opened at the antimesenteric border [Figure 1a]. The ureters were reimplemented in the end of the proximal ileal chimney with Bricker type anastomosis with polyglycolic acid suture number 4-0 [Figure 1b and 2c]. Two centimeters of the distal end of ileal chimney was intussuscepted into the ileal bladder pouch with serosal approximating sutures to create a nipple valve. The detubularized ileal segment was then spiraled upon itself taking care not to compromise the vascularity of the mesentery. Adjoining edges were sutured to each other with polyglycolic acid suture number 4-0 [Figures 1c, 2a, 2b]. The reconfigured ileal pouch was anastomosed to the native opened bladder thereby completing spiral-cap ileocystoplasty [Figure 1b and 2d]. Ileal chimney was primarily created to prevent transmission of high pressures to the upper tracts. Perivesical external drain,

Table 1: Patient characteristics

| Patient number | Demographic data | Indication for surgery | Preoperative nadir serum creatinine | Lower ureteric pathology | Ureteric reimplant during surgery | Operative time (hours) | Blood loss (ml), transfusion | serum creatinine at 1 month and 1 year | Bladder capacity (ml) | CIC requirement |
|----------------|------------------|------------------------|------------------------------------|--------------------------|----------------------------------|-----------------------|-----------------------------|-----------------------------|---------------------|-----------------|
| 1              | Female 46        | GU Koch's              | 1.6                                | B/L-Strictures           | B/L                              | 4.5                   | 600, no                     | 1.5, 1.6                    | 350                 | No              |
| 2              | Male 35          | GU Koch's              | 1.8                                | Right side-Stricture     | B/L                              | 5                     | 800, yes 2 PCV              | 1.6, 1.7                    | 400                 | No              |
| 3              | Female 40        | GU Koch's              | 1.5                                | B/L-Stricture            | B/L                              | 3.5                   | 700, yes 2 PCV              | 1.4, 1.6                    | 350                 | No              |
| 4              | Female 29        | GU Koch's              | 1.7                                | Right side-VUR Grade 3   | B/L                              | 4.5                   | 800, yes 2 PCV              | 1.7, 1.6                    | 350                 | Yes             |
| 5              | Female 44        | Iatrogenic injury      | 1.9                                | Left side-Stricture-B/L   | B/L                              | 5                     | 900, yes 2 PCV              | 1.5, 1.6                    | 300                 | No              |
| 6              | Male 52          | GU Koch’s              | 1.5                                | B/L-Stricture            | B/L                              | 3.5                   | 600, no                     | 1.3, 1.4                    | 350                 | No              |
| 7              | Male 32          | GU Koch’s              | 1.7                                | Right side-Stricture      | U/L                              | 3.5                   | 800, no                     | 1.5, 1.5                    | 400                 | No              |

GU Koch’s: Genitourinary tuberculosis, U/L: Unilateral, B/L: Bilateral, CIC: Clean intermittent catheterization, USG: Ultrasonography, PCV: Packed cell volume, VUR: Vesicoureteral reflux
suprapubic catheter, and per urethral catheter were placed postoperatively. Patients were given intravenous antibiotics for 5 days. Electrolytes, bicarbonate levels, and vital parameters were monitored. Suprapubic catheter was irrigated daily under gravity to prevent mucus accumulation. Perivesical drain was removed after reduction in output <50 cc. Ureteric stents were removed sequentially, and patients were discharged with suprapubic catheter in place. At 4–6 weeks, suprapubic tube was removed after obtaining a cystogram to check for any leak. All patients were kept on CIC in the initial period every three hourly. Gradually, the frequency of CIC was decreased, and patients were asked to void spontaneously. Postvoid residue was monitored, and patients with significant residue were asked to continue CIC. Radiographic surveillance for the upper tract and serum creatinine was asked for at 6 weeks, 3 months, 6 months, and yearly thereafter. GFR estimation was considered at 1 year follow-up.

RESULTS

The mean operative time required for our technique was 4.2 h (ranging from 3.5 to 5 h), and average blood loss was approximately 700 ml. Four patients required two packed cell volume replacement. There was no postoperative electrolyte or metabolic imbalances. None of the complications was more than Clavien-Dindo classification Grade 1 in the immediate postoperative period. In follow–up, mild metabolic acidosis was present in two cases which was controlled with oral bicarbonate maintenance (Clavien-Dindo classification Grade 2). Radiographic surveillance for the upper tract and serum creatinine was asked for at 6 weeks, 3 months, 6 months, and yearly thereafter. GFR estimation was considered at 1 year follow-up.

DISCUSSION

Small capacity poorly compliant bladder with or without ureteric involvement can be seen in infective pathologies of bladder such as genitourinary tuberculosis, schistosomiasis, and postradiotherapy cystitis.[2,3] Patients with small capacity, poorly compliant bladder with ureteric involvement often have compromised renal function. Hence, they warrant early management with surgical options so as to minimize the impact on renal function.

Augmentation ileocystoplasty is one such procedure for salvage of such patients with good long-term outcome. However, if small capacity bladder is associated ureteric involvement, the same ileal loop can be used in isoperistaltic manner for ureteric substitution along with augmentation.

Various types of gastrointestinal segments have been used for bladder augmentation, but ileum remains the most preferred of all. Von Mikulicz[4] described augmentation ileocystoplasty in 1889. Hinmann and Koff have described the advantages of opening the bowel at antimesenteric border, detubularization, and reconfiguration.[5] McGuire demonstrated the risk of elevated intravesical pressure on renal function.[6] Spherical shape is the most desired for reconfiguration because it has maximum volume for given surface area which causes blunting of bowel contractions and improvement in overall capacity and compliance in accordance with Laplace’s law.[7] Advantages of our technique include:

1. Bladder and lower ureter pathologies such as stricture and/or reflux are addressed simultaneously
2. The size of the ileal pouch (20–40 cm) can be adjusted according to the capacity desired and native bladder remnant
3. Anastomosis with bladder is wide and hence prevents diverticulum-like effect of augmented part
4. Pouch assumes a spherical shape and in accordance with Laplace’s law, which helps to reduce the intravesical pressure
5. The intussuscepted part of ileum into the pouch prevents the pressure of pouch to be transmitted to upper tracts
6. This technique may prevent the acute angulation of proximal ileal loop upon the augmented bladder as in traditional ileocystoplasty technique
Operative time and blood loss and bladder capacity in follow-up are comparable to the routine augmentation procedure.

CONCLUSION

Spiral-cap ileocystoplasty is a useful technique in patients who require simultaneous bladder augmentation and ureteric reimplant.

Acknowledgment
The authors would like to thank Department of Anesthesiology, LTMMC and LTMGH, Sion, Mumbai.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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