Laparoscopic mitrofanoff appendicovesicostomy: Our experience in children

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ABSTRACT

Introduction: The Mitrofanoff principle was originally described as a method to provide an alternative means to access the bladder. It creates a conduit to the bladder through which patients with a sensitive, absent, or traumatized urethra can perform clean intermittent catheterization (CIC) easily. We report our experience with complete laparoscopic Mitrofanoff appendicovesicostomy to promote a catheterizable abdominal stoma.

Materials and Methods: A 4-port transperitoneal approach was used to create a complete laparoscopic Mitrofanoff appendicovesicostomy.

Results: Six children with a mean age of 12.8 years (range 9-16 years) underwent laparoscopic Mitrofanoff appendicovesicostomy. Mean operative time was 139.6 min and Mean estimated blood loss was 46 cc. No cases of urinary leaks were noted. There have been no cases of either stomal stenosis or appendicovesical stenosis noted.

Conclusions: Pure laparoscopic Mitrofanoff appendicovesicostomy is feasible and is associated with reasonable outcome with early recovery, resumption of normal activities and excellent cosmesis.

Key words: Laparoscopy, mitrofanoff, surgical stoma, urinary diversion

INTRODUCTION

Mitrofanoff's contribution, now termed the Mitrofanoff principle, has had a profound effect on incontinence surgery in children. His development of alternative continent bladder access through a continent stoma has relieved the necessity for the patient to either void efficiently or to catheterize through the urethra. There have been other alternatives to Mitrofanoff’s original use of appendix for extra-anatomic access to the bladder. Other options for continent bladder access include ureter, fallopian tube, bladder tubes, and tubularized bowel.[1-3]

Many surgeons believe that catheterizable abdominal stomas promote continence by avoiding manipulation of the urethra or in some cases a reconstructed bladder neck. In some cases they encourage patient compliance with intermittent catheterization because catheterizing through an abdominal stoma is easier and less time consuming than urethral catheterization for many patients. Regular catheterization keeps bladder pressures low and minimizes stress on the urethra or reconstruction done at the bladder neck. Stomas allow the surgeon to be more aggressive in creating resistance at the bladder outlet because the urethra will not be needed as the primary access for catheterization. The combination of continent stomas and augmentation has allowed patients who have suffered multiple failed continence surgeries to be salvaged with good results.[4]

The Mitrofanoff procedure has traditionally been performed using an open surgical technique using either a lower midline or Pfannenstiel incision. There have been a few reports in the literature where laparoscopic techniques have been applied to this procedure in an attempt to minimize morbidity and improve cosmesis. Jordan and Winslow,[5] and

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Van Savage and Slaughenhoup\textsuperscript{6} described a laparoscopic assisted appendicovesicostomy where the appendix and right hemicolon were mobilized laparoscopically and the appendico-vesical anastomosis was completed through a Pfannenstiel incision. The most challenging part of the procedure is creating the appendico-vesical anastomosis. Intracorporeal suturing is a technically demanding task that requires a significant amount of experience and surgical skill. We report our experience with a complete laparoscopic Mitrofanoff appendicovesicostomy to promote a catheterizable abdominal stoma.

**MATERIALS AND METHODS**

A 4-port transperitoneal approach was used [Figures 1, 2]. A 10 mm laparoscopic camera port was placed through the umbilicus and 2, 5 mm laparoscopic ports were placed in the left lower quadrant and right midaxillary line at the level of the umbilicus. A fourth port was placed in the left midaxillary line, also at the level of the umbilicus. We began by mobilizing the appendix and right hemicolon up to the hepatic flexure. The mesentery of the appendix was identified and mobilized to obtain adequate length. The appendix was ligated and divided at its base and the stump was buried into the caecum using a 3-zero silk purse-string suture. The appendix was assessed to determine whether the length was adequate to reach the anterior abdominal wall (approximately 5 to 6 cm) and whether the diameter was of sufficient caliber to accommodate at least a 12 Fr catheter. This maneuver was done without desufflating the abdomen to allow more room for error in appropriating an adequate distance.

The bladder was filled with saline and a 5 cm vertical seromuscular incision was made in the right posterior wall of the bladder down to the mucosa [Figure 3]. After incision of the mucosa the appendix was anastomosed to the bladder using 4 zero polyglactin interrupted sutures. The seromuscular layer of the bladder was closed using interrupted 3 zero polyglactin sutures, [Figure 4] creating a tunnel for the appendix. The appendix was then brought up to the umbilicus and a catheterizable stoma was created [Figure 5]. Smooth catheterization through the appendix with full pneumoperitoneum and with the pneumoperitoneum released was performed. A 16 Fr suprapubic catheter was inserted into the bladder and a 10 Fr stenting catheter was left through the appendix.

The child was started on oral liquid feeds within 6--8 hours. The catheter was left indwelling for 3 weeks and was removed after ensuring that the patient or family could catheterize without difficulty.

**RESULTS**

During the period January 2004 and December 2009, six children with a mean age of 12.8 years (range 9--16 years) underwent laparoscopic Mitrofanoff appendicovesicostomy. Four of these children were male and the remaining two were female children. Three of these children had neurogenic bladder secondary to spina bifida, two had non-neurogenic
neurogenic (Hinman) bladder, and one child was a case of urethral stricture following posterior urethral injury and had undergone multiple surgeries for the same. The reasons for failed urethral CIC in these children included urethral strictures in three, Down’s syndrome in two and painful CIC in the remaining child.

Overall the mean operative time was 139.6 min (range 125--175 min). Mean estimated blood loss was 46 cc (range 32--72 cc). None of the cases needed conversion to open. All children had liquid diet in the evening of surgery or on the postoperative day 1. The median length of stay was 7 days.

Median follow-up was 33 months. Two children developed urinary incontinence via the Mitrofanoff; however both responded well to anticholinergic therapy. One of these children has been off anticholinergic therapy, while the other child still needs low dose anticholinergic therapy. One child had a severe episode of urinary infection in the follow-up period, but responded well to antibiotics. No cases of urinary leaks were noted. There have been no cases of either stomal stenosis or appendicovesical stenosis noted.

DISCUSSION

The Mitrofanoff principle was originally described as a method to provide an alternative means to access the bladder.[7] It creates a conduit to the bladder through which patients with a sensitive, absent, or traumatized urethra can perform clean intermittent catheterization (CIC) easily. Fashioning this continent, catheterizable channel using the appendix is often performed with open surgery. The use of laparoscopic and robot-assisted approaches to reconstruct the lower urinary tract has been slowly introduced in the past several years. Individual cases of laparoscopic[7,8] and robot-assisted[9] Mitrofanoff appendicovesicostomy have appeared in the literature. The adoption of a purely laparoscopic or robot-assisted approach to lower urinary tract surgery in pediatric patients has been slow, given the steep learning curve and relative paucity of cases.

Congruent with the limited published experience, the surgical outcomes have compared favorably with those of an open approach in these selected patients. Parents of children undergoing this minimally invasive procedure were satisfied with the short-term outcomes and postoperative recovery,[10] particularly early resumption of physical activity and the avoidance of a prolonged absence from school. In children approaching adolescence and adulthood, the perceived benefits of a minimally invasive approach such as lower analgesic requirements, improved recovery time and improved cosmesis might be more apparent than in younger children. Some surgeons have reported that prolonged operative time was a potential disadvantage associated with laparoscopic approach.[10] The operative time should improve significantly in subsequent cases with better handling of technical issues.

Our preliminary experience with this laparoscopic procedure has been favorable. Our reduced operative time has been due to our experience in performing laparoscopic pyeloplasty in children. In our experience the results have been comparable with most series of laparoscopic Mitrofanoff appendicovesicostomy.

The use of the da Vinci® robotic technology has added advantages for the pediatric population. It has allowed for the more complex laparoscopic procedures to be performed with greater dexterity.[11] Pedraza et al.[9] found that by incorporating the da Vinci® robotic system they were able to create efficiently a circumferential watertight appendicovesical anastomosis and decrease the overall operative time of the procedure. Nguyen et al.[12] reported on 10 patients who underwent the robot-assisted laparoscopic Mitrofanoff procedure using the da Vinci® surgical system. They similarly believe that the robot-assisted laparoscopic
Mitrofanoff procedure is feasible to perform, is associated with satisfactory outcomes and minimal complications, and has the benefits of a minimally invasive approach.

CONCLUSIONS

Pure laparoscopic Mitrofanoff appendicovesicostomy is feasible and is associated with reasonable outcome with early recovery, resumption of normal activities, and excellent cosmesis.

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