A Novel Vesicoscopic Bladder Wall Suture Fixation Technique to Aid Endoscopic Vesicostomy Button Insertion

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**Key Words**
Endoscopic insertion • Vesicostomy button • Vesicoscopic suture • Fixation technique • Ureteroscopic forceps

**Abstract**

**Background:** To describe a novel bladder fixation technique for use during endoscopic vesicostomy button insertion.

**Methods:** After standard cystoscopic visualization of the bladder, a standard 18 G intravenous cannula was inserted into the bladder. A non-absorbable suture thread was placed through this intravenous cannula under cystoscopic vision. The proximal end of the suture was then removed using standard ureteroscopic grasping forceps (3 Fr) through another needle (15 G) inserted next to the initial puncture site (following a path at 30 degrees from the initial puncture tract) into the bladder. The suture ends were brought out of the bladder and tied at the skin level, 2 cm from the intended vesicostomy site. Sutures were removed on the second postoperative day. **Results:** This fixation technique allows for adequate fixation of the bladder dome to the anterior abdominal wall. These sutures also have less potential for cutaneous scarring and pain. No complications were reported. **Conclusion:** This simple fixation technique is easily performed using materials found in every urology suite. It also avoids the skills required with other previously reported fixation suture techniques, and can also be utilized for bladder fixation in cases of vesicoscopic laparoscopic or robotic assisted laparoscopic procedures.

**Introduction**

In the management of children with acquired and congenital bladder conditions that require bladder drainage, it is crucial to protect the upper urinary tracts in order to avoid incontinence and urinary tract infections [1]. Over the years several different techniques of bladder drainage were described and the most popular one is clean intermittent catheterisation (CIC) which is becoming the standard management for poor bladder emptying [2, 3].

CIC via the urethra can pose a challenge based on the age, presence of behavioral disorders, and pain when the procedure is performed and because of anatomical variations within the lower urinary tract. More invasive options for bladder drainage include suprapubic catheterisation, Mitrofanoff continent urinary diversion, and the vesicostomy button [1]. The vesicostomy button was
first described in 2007 as an alternative option for short- to medium-term management while waiting for definitive treatment. Button vesicostomy was adapted from the Mic-key gastrostomy, which was invented for short- to long-term enteral nutrition in patients with feeding difficulties [1].
A literature review covering the PubMed and Scopus databases revealed several (surgical) endoscopic techniques of vesicostomy button placement. During the endoscopic insertion of both the gastrostomy button and vesicostomy button, various fixations sutures are utilized to anchor the stomach or bladder to the anterior abdominal wall. This step aids in allowing a firmer interface prior to puncturing the hollow distended organ. In cases of previous abdominal surgery, this is of more concern when placing the button, as inadvertent bowel injury may occur during the puncture or serial dilation process.

Although the bladder wall fixation sutures may not have been included in all the previously described endoscopic vesicostomy button insertion methods, more recent experiences have reported cases where the tract of the puncture was inadvertently directed in the subcutaneous plane above the bladder wall, when this fixation step was omitted [1].

We aimed to describe a novel, simple, reproducible method of bladder-to-anterior abdominal wall fixation, using a vesicoscopic technique.

**Material and Methods**

A 9-year-old child with a neurogenic bladder required intermittent bladder drainage. The mother reported on a history of two previous failed Mitrofanoff diversions performed at another center. An associated behavioral delay with a severe component of oppositional defiant disorder was also present and attempts at better control in this regard were underway.

Based on the above factors, the family opted for a button vesicostomy in the interim, since CIC therapy was just not possible, despite numerous attempts. Written consent, and local institutional ethics approval was obtained.

The procedure was performed under general anesthesia. The instruments utilized included: a standard cystoscopy set, 18 G intravenous (IV) cannula, a needle (15 G), flexible ureteroscopic forceps (3 Fr), and a nylon suture (1/0) × 3. The postoperative button care was as per Hitchcock et al. [4] 2006 button care protocol, and postoperative complications were characterized based on the Clavien-Dindo Classification [5].

The site of the vesicostomy button was identified. The center of the intended suprapubic button site was marked with a cross and multiples dot markings were made 2 cm radially from the cross. In that circular area, local anesthetic (1% lidocaine) was infiltrated at the three desired spots of fixation. A cystoscope was introduced into the bladder and the bladder was filled with normal saline. Under ultrasound guidance the 18 G IV cannula was safely introduced through a dot mark and through the abdominal wall into the bladder under direct cystoscopic vision. The metal needle of the IV 18 G cannula was removed and the cannula sheath was left in the bladder. A nylon suture thread (15 cm length) was advanced through the IV cannula, and passed into the bladder. A 15 G needle was then inserted through the abdominal wall into the bladder via the same skin puncture site previously made, but this time, the needle was directed at a 30º angle to the first needle. It was passed into the bladder, still under ultrasound guidance and cystoscopic vision. Flexible ureteroscopic forceps were advanced through the 15 G needle lumen into the bladder and the free end of the nylon stitch was grasped. The needle together with the ureteroscopic forceps were brought through the same site allowing for both free nylon ends to be tied at the skin level. The same procedure was performed twice more resulting in a triangular fixation anchoring the bladder wall to the anterior abdominal wall. Using the Seldinger technique and Amplatz dilators, a 14 Fr vesicostomy button was then inserted. The balloon was inflated with water at the end of the procedure. All three fixation sutures were removed as an outpatient procedure on the second postoperative day (fig. 1).

**Fig. 2.** Photograph depicting the postoperative surface view. Photographs taken at postoperative (A) day 2, immediately after stitch removal, and (B) day 14.
Table 1. Tabulation of the literature review of button vescostomy/gastrostomy suture fixation techniques to allow for subsequent endoscopic button insertion

| First author/Ref/Year | Procedure | n | Instruments utilized | Fixation stitch tech| Endoscopic visualisation | Organ distention performed via | Complications | MFU |
|-----------------------|-----------|---|---------------------|---------------------|--------------------------|-------------------------------|---------------|-----|
| Georgeson[9] 1998     | B. Gas    | > 200 C | semi-circular needle | “U stitch”, through-and-through, tied down × 2 on the skin | laparoscopy | OG tube | N/S | N/S |
| Patkowski [8] 2006    | B. Gas    | 106 C | straight hollow needle | “U stitch”, thread loop | laparoscopy | N/S | 3 punctured iliac veins 1 bowel strangulation from adhesion 3 hernia recurrences | N/S |
| Aprahamian[10] 2006   | B. Gas    | 444 C | curve needle | “U stitch”, through-and-through, tied down × 2 to the button | laparoscopy | OG tube | 7 reoperations for tube dislodgement 3 herniations of omentum 13 granulation tissues requiring excision 8 revisions local site problem 5 intraperitoneal placement of tubes | 2.58 years |
| Hitchcock[4] 2007     | B. Ves    | 21 C | curved needle | bladder wall sutured to anterior abdominal wall × 2 | open procedure | N/S | 5 granuloma formations 3 local infections 4 UTI 3 peristomal leaks 1 wound infection 4 peristomal leaks | 30 months |
| Millike[11] 2007      | B. Ves    | 17 C | N/S | bladder wall sutured to anterior abdominal wall | open procedure | N/S | 6 converted to open 2 hematomesis 2 cellulitis 1 colonic perforations 2 granulation tissues requiring excision 1 persistent gastrocutaneous fistula | 578 days |
| Haider[7] 2008        | B. Ves    | 12 C | straight hollow needle | no “U stitch” or suturing to bladder. Guide wire inserted through needle | cystoscopy | cystoscope | none | N/S |
| Mattei[12] 2009       | B. Gas    | 100 | straight hollow & curved needle | “U stitch”, thread loop used to remove curved needle, tied down × 2 on the skin | gastroscopy | gastroscope | N/S | N/S |
| Nixdorf[13] 2010      | B. Gas    | 121 | curved needle | “U stitch”, through-and-through, tied down × 2 over cotton bolsters | gastroscopy | gastroscope | 6 converted to open 2 hematomesis 2 cellulitis 1 colonic perforations 2 granulation tissues requiring excision 1 persistent gastrocutaneous fistula | 378 days |
| Lacreuse[6] 2010      | B. Ves    | 10 C | N/S | as per Georgeson 1998 technique above | cystoscopy | cystoscope | none | 1 year |
| Lacreuse[14] 2012     | B. Ves    | 21 C | N/S | as per Georgeson 1998 technique above | cystoscopy | cystoscope | none | 2 years |
| Colliver[15] 2012     | B. Ves    | 4 C | N/S | N/S | N/S | N/S | none | N/S |
| Braithwaite[2] 2014   | B. Ves    | 30 | N/S | bladder wall sutured to anterior abdominal wall × 2 | open procedure | N/S | 2 new UTI 3 major leaks 1 device failure 4 transient leaks 4 wound infections 4 over-granulations | 11 months |
| Ghan[16] 2013         | Percutaneous suprapubic tube | 339 | curve needle | horizontal mattress suture from anterior bladder wall to anterior abdominal wall tied onto skin over a plastic button | laparoscopy | robotic assisted | 1 bladder neck contracture | 2 years |
| Seifarth[17] 2015     | B. Gas    | 24 | straight hollow needles | “U stitch”, thread loop, tied down × 2 to the button | gastroscopy | gastroscope | 1 over-granulation | 4 weeks |
| Mosiello[1] 2016      | B. Ves    | 16 | straight hollow needles | “U stitch”, thread loop, tied down × 2 to the button for > 48 hours then removed | cystoscopy | cystoscope | no statistically significant difference in terms of complications. | 37 months |
| 19                    | B. Ves    | 1 C | fig. 1p | (fig. 1, a–o) vesicoscopic ureteroscopic grasping suture fixation technique | open | N/S | 6 UTI 1 button decubitus 1 UTI button side infection 1 stone with UTI 1 button leakage and UTI 1 difficulty in bladder employing and UTI 1 button leakage | 4 months |

*Novel Method Described*
Results

The total operative time was 30 minutes. The end result had an acceptable cosmetic outcome at follow-up (fig. 2). There was no intraoperative complication. The post operation recovery was uneventful, without any episodes of urinary leakage. The patient was followed-up at 2 weeks and 4 weeks post operatively.

Discussion

The vesicostomy button has been classically inserted after an open technique through a mini-Pfannenstiel incision or through a previous cystostomy [6]. Haider et al. [7] described a percutaneous endoscopic approach of vesicostomy button insertion in 2008. This procedure was less invasive and enabled precision in the positioning of the button thus preventing urinary leakage [7]. Many of the endoscopic vesicostomy or gastrostomy button insertion techniques are based on the principle of an anchoring, ‘U-stitch’ to anchor the anterior bladder or stomach wall to the anterior abdominal wall [8]. Subsequently this fixation stitch technique has been modified (table 1), with various levels of skill and expertise needed to accurately perform them. These methods may also be more time consuming.

The vesicostomy button device was primarily designed in 1982 as a gastrostomy button for prolonged enteral feeding [4]. In 1996 de Badiola et al. [18] first described the use of the gastrostomy button as a vesicostomy button when temporarily closing a vesicostomy in children after urodynamic studies. Initially the procedure was performed using an open technique and was later carried out endoscopically [7]. Following this, the button was used in an adult group in the management of an areflexic neurogenic bladder as an alternative to a suprapubic catheter but the use was limited due to the length of the device tract from the skin to the bladder wall [2]. The Mic-key gastrostomy device which is currently used as a vesicostomy button allows opportunity for intermittent catheterisation and also helps to achieve continence [2]. For instance when the button is used as a catheterized stoma, it is a safe and an effective option [6]. There are several papers in the literature regarding benefits of nocturnal bladder emptying for the reversal or prevention of bladder and upper tract deterioration [19]. The vesicostomy button can be used as a continuous nocturnal indwelling drainage device where bladder insensitivity and over-distention coexist [20, 21]. Proper button care protocol is important so as to avoid any infection and Bradshaw et al. [2] described one such protocol which takes into account free drainage for first 2 days together with parents or carer’s education and regular button exchanges. It was further noticed that most of the patients and their families accepted the vesicostomy button without much opposition as a more flexible way of bladder management and found it to be more cosmetically acceptable, with an evident improvement in the quality of life [2, 7].

The novel fixation technique described here, may also be used in cases of vesicostomy laparoscopic/robotic assisted laparoscopic surgery, where previous bladder fixation methods include stone basket extraction of the free suture end [22] or the fixation being performed using the loop stitch via a 21 G needle [23, 24].

Our described method is superior to the other listed methods, as the surgeon has easier access to the free end of the suture thread and it can be performed with ease in a reproducible, time saving manner.

Conclusion

Although other suture fixation techniques have been described (table 1), we have presented an easier and less technically challenging fixation technique using a vesicoscopic approach with flexible ureteroscopic grasping forceps (3 Fr), an instrument found in all endo-urology suites. This allows for a less “constricted” skin segment, with less resultant pain and an overall better cosmetic result.

The suture fixation prior to endoscopic button insertion may be much more relevant in small contracted bladders, patients with previous abdominal surgery, diversion procedures, or abdominal obesity. This surgical step may also serve to decrease the potential risk of bowel injury during serial dilation or inadvertent deviation of the dilation tract during the subsequent endoscopic vesicostomy button insertion procedure.
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