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Button vesicostomy: 13 years of experience

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Abstract *Introduction:* Over recent years the button vesicostomy has become an alternative management option in children with poor bladder emptying, when clean intermittent catheterisation (CIC) cannot be initiated for reasons of age, sensation, or urethral anatomy. This study reviews recent experience of this technique and evaluates its use.
Methods: Retrospective review of patients who had a button vesicostomy to permit bladder drainage between 1998 and 2011.
Results: Thirty children underwent button vesicostomy insertion aged between 4 days and 16 years. Indications were neuropathic bladders ($n = 15$), congenital hypotonic bladders ($n = 6$), functional bladder disorders ($n = 5$), and post-obstruction bladders ($n = 4$). The median length of use was 11 months; however, 7 patients still have the button in situ. Minor complications ($n = 12$) included transient leakage, wound infection, and overgranulation. Major complications included 2 UTIs, 1 device failure, and 2 significant leaks, requiring revision of the tract and removal of the button.
Conclusion: The button vesicostomy is a suitable and safe technique for use in the short- and medium-term. The procedure has minimal morbidity and therefore is acceptable to families. It has a wide scope, including patients with a neuropathic bladder as an alternative to CIC and where temporary drainage is required until bladder function can recover.

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Introduction

Clean intermittent catheterisation (CIC), popularised in 1972, is now the standard management for patients with poor bladder emptying to protect the upper tracts and maintain continence [1]. However it can be challenging to achieve CIC in certain patients owing to age, anatomical variations, or pain. Alternative options for these children include suprapubic catheterisation (SPC), Mitrofanoff formation, or, a more recent addition in selected cases, a button vesicostomy [2,3].

In 2007, the button vesicostomy was described as a useful alternative short- or medium-term option for a catheterisable continent urinary stoma in children. The button vesicostomy uses a short, low-profile gastrostomy tube, originally designed for long-term enteral nutrition in patients with feeding difficulties [4], and provides a simple primary continent urinary stoma.

This study aimed to review the indications for, and complications and outcomes from, using a button vesicostomy.

Materials and methods

Thirty patients underwent a button vesicostomy insertion between 1998 and 2011 at a paediatric urology centre. Follow-up information was available on all patients and was gained from a retrospective review of the case notes. Information recorded included indications, diagnoses, age at insertion, technique of insertion, button type and size, duration of use, complications, reason for removal, and clinical outcome following removal. Formal ethical approval was not required as this research was conducted on previously collected non-identifiable information.

The children required intermittent bladder drainage for poor bladder emptying for a variety of underlying reasons. However, they had all been unable to establish CIC, usually owing to mechanical difficulties, age, or pain. The age at insertion of the button vesicostomy ranged from 4 days to 16 years, with a median age of 4 years.

Placement protocol

Two different types of button were used: the Mic-Key button (Ballard Medical Products) and the Mini balloon button (Applied Medical Technology). The Mic-Key button was used more frequently; 25 patients had the Mic-Key button at initial insertion. Both buttons are silicone devices. They consist of an internal portion, resembling the tip of a Foley catheter, with an inflatable balloon to allow it to be self-retaining. The external portion is comprised of a flat button that sits on the skin surface. It contains a valve to prevent leakage unless the drainage adapter is in place. The devices are available in a range of sizes (12—24 Ch) and lengths (0.8—5.0 cm), and this was chosen on an individual basis (Fig. 1).

A standardised open surgical technique, performed under general anaesthesia, was used to insert the button vesicostomy in 18 patients. This technique involved a 2-cm transverse skin crease incision in the lower abdomen. The linea alba and rectus fascia were incised transversely in the midline and the muscle split to expose the urinary bladder. A purse string suture was placed in the bladder apex. A button of suitable length was inserted below the initial incision, via a separate midline 5-mm stab incision through the abdominal wall layers and placed within the purse string suture. The balloon was then inflated and the purse string snugged tight. Two large vicryl sutures were placed on either side to anchor the bladder to the anterior abdominal wall. The incision was closed with absorbable subcutaneous sutures.

Of the remaining 12 patients 3 alternative techniques for button vesicostomy insertion were used. In 6 patients a previous suprapubic catheter was present, and the button was used to replace this catheter via the pre-existing tract. Three patients had a previously formed classical vesicostomy through which the button was inserted; this allowed occlusion of the vesicostomy tract in the short-term for further assessment of bladder function. The button was not expected to fully occlude the vesicostomy and leak was therefore predictable. Three patients had the button inserted with an open surgical technique similar to the standardised technique already outlined. However, these patients had their button inserted prior to the standardisation of the technique and therefore the procedure did not include a purse string suture to snug the button.

Button care protocol

Immediately following insertion of the button vesicostomy each patient remained on continuous free drainage for 48 h before an individualised intermittent drainage regime was started. Parents or carers were educated in emptying the bladder with the appropriate connector. The first button exchange took place with the urology nurse specialists as an outpatient 6 weeks after insertion. Subsequent exchanges were predominantly done by the family at home. Exchanges were initially done at 6-weekly intervals. As experience and knowledge developed with the button vesicostomy, the interval for button exchanges was increased to 3-monthly owing to low infection rates.

Results

Indications

A button vesicostomy was selected for four reasons: (1) temporary management as bladder recovery was deemed possible ($n = 5$); (2) to allow assessment for additional surgery, such as augmentation ($n = 6$); (3) to assess bladder function pre-closure of vesicostomy ($n = 2$); (4) to provide time to establish a CIC regime ($n = 17$).

The most common indication for button placement was for neuropathic bladder ($n = 15$) requiring intermittent drainage while CIC could be established. The underlying pathologies resulting in a neuropathic bladder included anorectal malformations ($n = 7$), Spina bifida ($n = 4$), meningitis ($n = 1$), Neuroblastoma with spinal cord compression ($n = 1$), visceral myopathy ($n = 1$), and unknown origin ($n = 1$).

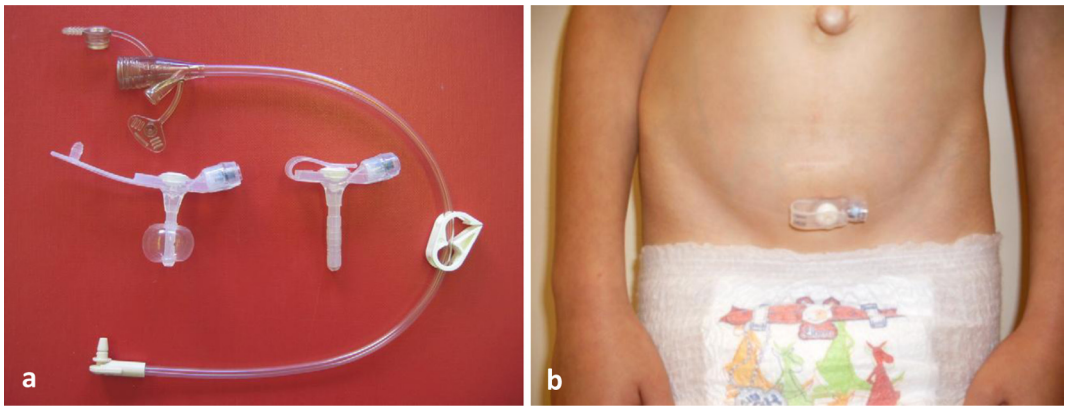

Figure 1 a. Mic-Key button (gastrostomy button; Ballard Medical Products). b. Button vesicostomy in situ. Written consent was obtained for the use of the patient photograph.

Other indications included congenital hypotonic bladder ($n = 6$), functional bladder disorders ($n = 5$) and post-obstruction bladders ($n = 4$). Of the functional bladder disorders there was 1 patient with Hinman syndrome, 2 patients with painful dysuria and urinary retention secondary to posterior urethritis, and 2 patients with idiopathic functional bladder disorder. The underlying pathology resulting in post-obstruction bladders included 2 patients with posterior urethral valves, 1 patient with urethral hypoplasia, and 1 patient with a large utricle (Table 1).

Complications

In total, 16 patients suffered from 18 complications following insertion of the button vesicostomy (Table 2). Complications were divided into major and minor based on the Clavien classification of surgical complications; minor complications included those that were not potentially life-threatening and that did not require treatment or interventions (Grade I), while major complications included all events that were potentially life-threatening without pharmacological (Grade II) or surgical intervention (Grade III). There were no complications that led to organ dysfunction (Grade IV) and no mortality (Grade V) [5]. Minor complications ($n = 12$) included transient leaks ($n = 4$), wound infections ($n = 4$), and overgranulation ($n = 4$). These occurred frequently (40%); however, they either settled spontaneously or resolved with simple topical measures. Four patients suffered from a transient leak from the button site, which either settled with time or with a change in button size. Of these 4 patients, 1 had the button inserted via a pre-existing SPC tract, 2 had the standardised open technique for insertion of the button, and 1 had the open technique without the purse string suture. Four patients suffered from wound infections post-operatively, which were managed with good wound care and topical antibiotics. Four patients developed minor overgranulation at the button site; treatment included topical silver nitrate and all resolved.

Major complications ($n = 6$) included significant leaks ($n = 3$), UTI ($n = 2$), and device failure ($n = 1$). Three patients suffered from significant leakage from the button site. Two of these cases were early on within the series and the procedure for insertion did not include a purse string suture. Subsequently, the operative technique was standardised to include a purse string suture aimed at reducing the risk of postoperative leak. One of these patients underwent successful revision of the vesicostomy tract; the other patient had the button removed. The third patient to have a significant leak had the button inserted through an existing classical vesicostomy; therefore, a leak was an expected consequence.

One button blocked owing to device failure and required replacement.

Seven patients had ongoing recurrent UTIs prior to button vesicostomy insertion. Six of these patients continued to suffer from recurrent UTIs following button vesicostomy insertion, while one patient experienced resolution of their UTIs. Two patients developed a single UTI after button vesicostomy insertion out of 23 patients without previous history of UTIs (8.7%) and a total of 405 months of button use. For both these patients the UTI was managed with admission to hospital, antibiotics, and exchange of the button. No patients required permanent removal of their button as a result of UTIs.

No patients developed bladder stones or encrustation of the tube secondary to button placement within this series.

Of the 18 patients that had their button vesicostomy inserted by the standardised open approach, minor complications occurred in 8 patients (44.4%), including transient leaks ($n = 2$), wound infections ($n = 3$), and overgranulation ($n = 3$). Major complications occurred in 2 patients (11.1%): 1 UTI and 1 device failure.

Outcomes

Buttons were left in situ until physiological voiding was achieved, CIC was established, or definitive management performed. Twenty-three patients have had the button removed, and within this group the duration of use ranged from 1 to 38 months (median = 11.0 months). Ten patients went on to achieve adequate voiding following removal of their button vesicostomy; however, of these, 2 patients are still unable to achieve continence. Eight children successfully learnt CIC. Four patients went on to have further

Table 1 Indication, complications, and outcomes for each patient within the series.

	Age at insertion	Diagnoses	Access via	Complications	Duration of use (months)	Outcome
1	8 years	Primary detrusor failure	Standard open	Overgranulation	3	Initially CIC now voiding
2	15 years	Posterior urethritis with secondary bladder failure from retention	Non-standard open	Leak—transient	12	Voiding
3	1 year	Urethral hypoplasia	Classic vesicostomy	UTI	7	CIC
4	2 years	Congenital hypotonic bladder	Standard open	Wound infection	4	CIC
5	2 years	Idiopathic functional hypotonic bladder	SPC	Overgranulation wound infection	8	Voiding
6	7 years	Congenital hypotonic bladder	Standard open	Overgranulation UTIs—before and after	11	Initially CIC now voiding
7	12 years	Neuropathic bladder Spina bifida	Standard open	Device failure— unable to drain	12	Mitrofanoff
8	6 years	Congenital hypotonic bladder	Standard open	Wound infection	38	CIC
9	3 years	Neuropathic bladder anorectal malformation	SPC	Leak—transient	2	Voiding (remains incontinent)
10	7 months	Neuropathic bladder anorectal malformation	Standard open	UTIs—before and after	4	Voiding (remains incontinent)
11	4 days	Posterior urethral valves	Standard open	None	14	Voiding
12	2 months	Neuropathic bladder	SPC	None	8	CIC
13	5 years	Posterior urethral valves	Standard open	UTIs—before and after	15	Mitrofanoff
14	2 years	Neuropathic bladder anorectal malformation	Non-standard open	Leak—required revision of tract	13	Monti-Mitrofanoff
15	5 years	Neuropathic bladder Spina bifida	Classic vesicostomy	Major leak	1	Returned to classic vesicostomy
16	7 years	Neuropathic bladder VACTERL association	SPC	UTIs—before and after	66 (in situ)	
17	1.5 years	Neuropathic bladder	Classic vesicostomy	None	57 (in situ)	
18	10 years	Functional hypotonic bladder	Standard open	Overgranulation	20	Voiding
19	7 years	Functional hypotonic bladder Hinman syndrome	Standard open	Wound infection	15	CIC
20	7 months	Neuropathic bladder anorectal malformation	Standard open	UTIs—before and after	29	Voiding

(*continued on next page*)

Table 1 (*continued*)

	Age at insertion	Diagnoses	Access via	Complications	Duration of use (months)	Outcome
21	2 years	Neuropathic bladder Meningitis	Standard open	Leak—transient	25 (in situ)	
22	4 years	Neuropathic bladder Neuroblastoma with spinal cord compression	Standard open	None	32	Voiding
23	1.9 years	Neuropathic bladder anorectal malformation down's syndrome	Standard open	UTI Leak—transient	36 (in situ)	
24	14 years	Posterior urethritis with secondary bladder failure	Non-standard open	Leak—button removed	5	Voiding
25	6 years	Post-obstruction bladder large utricle	SPC	None	25 (in situ)	
26	7 years	Congenital hypotonic bladder	Standard open	UTIs—before and after	5	CIC
27	7 years	Neuropathic bladder Spina bifida	Standard open	None	23 (in situ)	
28	11 months	Neuropathic bladder anorectal malformation	SPC	None	12 (in situ)	
29	12 years	Neuropathic bladder Spina bifida	Standard open	None	29	Mitrofanoff
30	2.5 years	Congenital hypotonic bladder	Standard open	None	4	Mitrofanoff

Note. VACTERL = Vertebral, Anorectal, Cardiac, Trache-oEsophageal fistula, Renal and Limb anomalies; SPC = suprapubic catheterisation; CIC = clean intermittent catheterisation.

Table 2 Complications following button vesicostomy insertion.

Complication	Technique used for insertion				Total no. all techniques ($n = 30$)
	Standard open ($n = 18$)	Non-standard open ($n = 3$)	Pre-existing SPC ($n = 6$)	Classical vesicostomy ($n = 3$)	
Major complications (Clavien Classification Grade II or III)					
New UTI[a] (out of 23 patients without previous UTI)	1 (8.3%) [$n = 12$]	0 [$n = 3$]	0 [$n = 2$]	1 (33.3%) [$n = 3$]	2 (8.7%) [$n = 23$]
Major leak	0	2 (66.7%)	0	1 (33.3%)	3 (10%)
Device failure	1 (5.6%)	0	0	0	1 (3.3%)
Total no. of major complications	2 (11.1%)	2 (66.7%)	0	2 (66.7%)	6 (20%)
Minor complications (Clavien Classification Grade I)					
Transient leak	2 (11.1%)	1 (33.3%)	1 (16.7%)	0	4 (13.3%)
Wound infection	3 (16.7%)	0	1 (16.7%)	0	4 (13.3%)
Overgranulation	3 (16.7%)	0	1 (16.7%)	0	4 (13.3%)
Total no. of minor complications	8 (44.4%)	1 (33.3%)	3 (50%)	0	12 (40%)

Note. Percentage expressed out of the total number of patients without previous UTIs, given in square brackets [$n = 23$].
[a] New UTI defined as a UTI that developed in a patient that did not previous suffer from recurrent UTIs prior to button insertion; therefore, those with pre-existing recurrent UTIs excluded from this row.

definitive surgery with Mitrofanoff formation. One patient who had a button inserted in order to assess bladder function prior to closure of a classical vesicostomy suffered from significant leakage and, as such, the assessment was unsuccessful. In this patient it was felt that further definitive surgery would not be appropriate owing to multiple co-morbidities. Therefore, the button was removed and his classic vesicostomy was left on free drainage.

Four patients had their button vesicostomy electively closed during definitive surgery. Two classical vesicostomies were electively closed without trial of spontaneous closure. The remaining 16 all underwent successful trial of spontaneous closure.

Seven patients still have their button in situ. In this group of patients the button has been extremely well tolerated, with no complications and a duration of use ranging from 12 months to 5.5 years (median = 25 months).

During this series, informal feedback received by our clinical nurse specialist indicated that the button vesicostomy was well tolerated by patients and their families. No patients requested that the button vesicostomy be removed prematurely. The seven patients that still have the button in situ have requested to keep the button for as long as possible.

Discussion

Intermittent catheterisation for management of neurovesical dysfunction was first introduced by Guttman and Frankel in 1966 [6] and then popularised as a non-sterile technique by Lapides et al. [7]. Since then, CIC has rapidly become the mainstay of management of voiding failure, as it has been shown to be safe and effective, with good long-term outcomes and minimal complications [1].

The adaptation of the Mic-Key gastrostomy button for vesicostomy was first described in 1996. It was used for clinical and urodynamic assessment of bladder function prior to closure of a long-standing vesicostomy [8]. Following this, it has been used to improve quality of life in the adult population as an alternative to a suprapubic catheter in the management of areflexic neurogenic bladders. However, the use of this device in adult patients was limited by the length of the tract between the bladder wall and the skin in approximately half the patients [9]. The technique has now been translated into paediatric practice. It utilises the Mic-Key gastrostomy button as a vesicostomy to allow intermittent drainage of the bladder. The button vesicostomy has become an alternative option for children with poor bladder emptying, as it both protects the upper tracts and helps achieve continence [2].

This series describes a large group of patients all who had a button vesicostomy used for a period of time, up to 5.5 years, in order to manage their bladder emptying. Four main indications were identified for choosing this option and, most commonly, it was used in patients with a neuropathic bladder.

An open technique was the standard method of insertion within this series, unless a suprapubic catheter or classical vesicostomy was already present. The technique was developed over the first couple of years of use to ultimately include both a purse string suture to hold the button in place and reduce the chance of leakage, and additionally two strong anchoring sutures to adhere the bladder to the anterior abdominal wall in order to prevent loss of the tract and facilitate button exchange.

Other centres have described an endoscopic technique for insertion of the button. This technique involves percutaneous insertion of the button using cystoscopic control and has been reported as a safe alternative to open insertion [10]. One group reports significant leakage with open insertion of the button vesicostomy, while they observed no leakage with endoscopically-inserted buttons [11,12]. In the series reported here, since adoption of the standard

open technique to include the purse string suture, the leaks observed were minimal and resolved with time or exchange of the button. It was felt that by using a purse string suture to give a snug fit with the button the open technique used gives equivalent results to the endoscopic technique for insertion. Further evaluation and comparison of the open vs. endoscopic technique is needed to determine the advantages and disadvantages of each procedure.

It is well known that a multitude of factors contribute to causing UTIs [13—15], and a full and complete discussion on this is outwith the scope of this paper. However, a couple of factors are of specific relevance in these patients: poor or intermittent bladder emptying, and colonisation with bacteria related to the presence of an indwelling foreign body [16]. It could be anticipated that the presence of an indwelling device in the bladder with a system that is only intermittently drained might cause frequent and/or severe UTIs. However, this was not the case in this series. Only 2 patients had a first UTI after button placement, and these infections were not repeated in a total of 405 months of button use. Children whose bladders were resistant to the development of UTIs despite poor bladder emptying remained resistant to them while the button was in situ, despite the likelihood that the buttons were colonised.

Additionally, although it could also be anticipated that better bladder emptying in children who suffer from UTIs relating to poor bladder emptying would help reduce the frequency of or resolve the UTIs, this benefit was not seen. Recurrent UTIs continued in 6 out of 7 patients with pre-existing UTIs, despite intermittent drainage.

The choice of the initial button exchange protocol of every 3 weeks was based on the assumption that infection and encrustation would be problematic. As experience was gained it became clear that for the majority of children less frequent exchanges would be appropriate. Initially, the regime was increased to 6—8 weeks but, over time, this further increased to every 3 months due to the low rates of infection and encrustation.

Minor complications—those that did not require significant pharmacological or surgical intervention (Clavien Grade I)—did occur frequently and these were complications associated with the button site. No life-threatening complications (Clavien Grade IV) or mortality (Clavien Grade V) occurred within this series. The minimal morbidity observed in this series suggests that the button vesicostomy is a safe alternative technique for intermittent bladder drainage in these patients and the safe period of use can now be extended.

It was observed, although not formally investigated, that the majority of patients and their families tolerated the button vesicostomy extremely well. Importantly, feedback from families suggested that it allowed children a more flexible approach to bladder management, which we feel may lead to an improvement in quality of life. At this stage, further studies into the effect of the button vesicostomy on quality of life for these children and their families is needed, and comparisons with the alternative techniques available, such as SPC, CIC, and Mitrofanoff, are also required. We feel that the added flexibility may facilitate definitive techniques, such as CIC and Mitrofanoff, by allowing child maturation and development, and by permitting family education without time pressure, until the correct definitive management can be selected and planned. In addition, if tolerated well, it may be used long-term.

Within this series, we treated 2 unusual cases of posterior urethritis with button vesicostomy. The aetiology of posterior urethritis remains obscure; however, the idiopathic inflammation of the prostatic and membranous urethra tends to occur in boys aged 5—17 years [17]. We usually manage this conservatively, with close observation for complications such as stricture formation [18] or bladder dysfunction [19], until resolution with time. For the 2 patients in this series the diagnosis was made based on the presenting symptoms of painful voiding and haematuria, and cystoscopic findings showing inflammation of the posterior urethra. These 2 children developed large post-void residuals without stricture as a result of painful voiding. The button vesicostomy was used to protect the bladder and upper renal tracts while the condition resolved and normal voiding was re-established.

The button vesicostomy was used with the expectation that it would be an interim measure. However, in 7 patients, it has proven to be an acceptable and effective longer-term solution and is in continuing use. The long-term role of the button vesicostomy is yet to be fully determined and the complications associated with its long-term use have yet to be evaluated. Therefore, to date, it has not been our policy to offer vesicostomy buttons as a long-term solution, although some families have requested it. In view of these results we may consider this option in the future. However, this must be done cautiously. Evidence suggests that there is an increased risk of bladder stone formation and carcinoma with long-term indwelling urinary catheters [20—22]. Therefore, if long-term use of a button vesicostomy is going to be considered, then the risk of stone formation and carcinoma will need to evaluated with prospective long-term studies.

Conclusion

The button vesicostomy is a straightforward surgical procedure with minimal morbidity. It has proven to be useful in selected patients unable to perform urethral CIC, in the short- and medium-term. It seems to be readily accepted by patients and families as it is both cosmetically pleasing and technically easy to manage. The button vesicostomy has a wide scope, including patients with a neuropathic bladder as an alternative to CIC, and in cases where temporary drainage is required until recovery of bladder function has occurred. Further long-term evaluation, quality of life studies, and comparison with more established techniques for intermittent bladder drainage is needed to fully clarify the role that the button vesicostomy will play in the management of these complex children.

Conflict of interest

None.

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None.

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