The Oxford 'Bladder Button' in Detrusor Overactivity

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Abstract

A gastrostomy PEG device is used to further develop the 'Bladder Button' concept, proposed as a means to intermittently drain the overactive neurogenic bladder. Three study participants were fitted with the device and have used it continuously for up to 4 years with device changes typically every 3-6 months (max 9 months). All participants were existing users of continuous-drainage suprapubic indwelling catheters. Two of the participants had mid-thoracic spinal cord injury and one patient suffered from multiple sclerosis, all had urodynamically proven detrusor over activity.

The 'bladder button' in the overactive bladder is a concept that merits further study and refinement; in the long-term it may prove to be a favoured alternative to the indwelling Foley catheter in this cohort of patients. Gastrostomy buttons are not designed for this application but have been useful to explore the possibilities. There is considerable scope for technical improvement in the PEG device itself to allow for easier manipulation, extend device life or even to incorporate sensors to monitor intravesical pressure traces; to provide a trigger for conditional FES neuromodulation, or adding biofeedback mechanisms which could be used to alert patients to a full bladder or modulate pharmacotherapy.

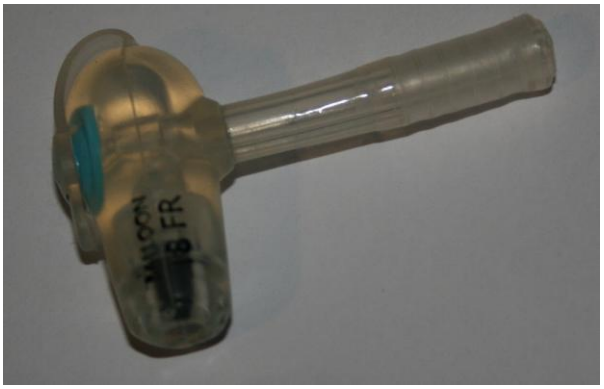
***Keywords**: neurogenic bladder, FES bladder control, suprapubic catheters*

Introduction

It is well recognized that long-term indwelling Foley catheters are associated with significant morbidity. External collection devices have a poor cosmetic appearance and negatively impact on patients' self-image and dignity. The use of catheterisable gastrostomy PEG devices, sometimes referred to as 'buttons' have been reported for bladder drainage in children as well as adults with areflexic bladders [1,2]. We propose the use of a 'Bladder Button' based on the design of the gastrostomy device used in combination with FES neuromodulation or pharmacotherapy for the long-term management of neurogenic detrusor overactivity [5].

The overactive neurogenic bladder typically has a low functional volume which can be treated pharmacologically or by electrical stimulation applied to a relevant sacral sensory nerve. We have previously demonstrated that surface electrical stimulation of the posterior tibial nerve can be effective in some patients [3]. The electrical stimulation is best applied just before the onset of a bladder contraction – conditional neuromodulation [4]. This requires a trigger signal which we have obtained by monitoring the pressure in the button's water filled retaining balloon, as shown in a typical recording in figure 3. It can be seen that this pressure signal closely follows the bladder pressure and can be used to trigger conditional neuromodulation. High frequency transients, for example caused by a cough are shown in fig 3, which can be removed by real-time digital filtering.

The aim of the present study is to determine limitation of a PEG type gastrostomy button when used for intermittent bladder drainage in adults with neurogenic detrusor overactivity.



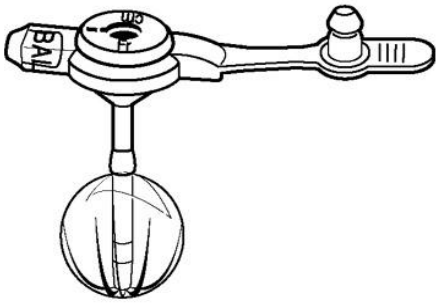


Figure 1: Gastrostomy Button showing the water filled retaining balloon empty and inflated.

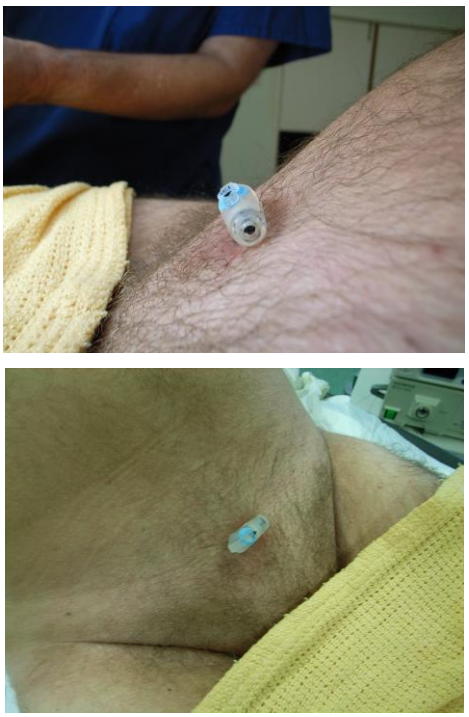


Figure 2: Button surgically implanted into bladder.

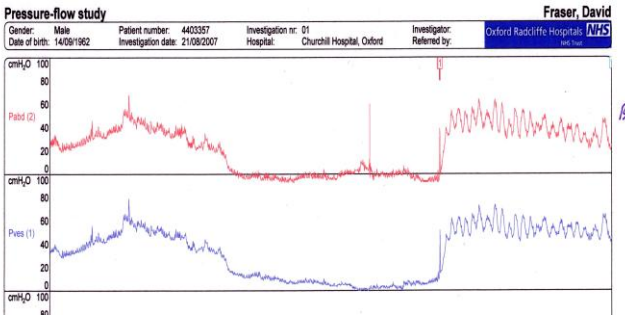


Figure 3: Typical pressure record during cystometry. Upper trace is the pressure recoded from the button balloon, lower trace simultaneous intravescical pressure determined from a urethral catheter and anal reference.

Materials and methods

Between 2007 and 2010 after local ethics committee approval three study participants were fitted with the device. All participants were existing users of continuous-drainage suprapubic indwelling catheters. Two of the participants had mid-thoracic spinal cord injury and one patient suffered from multiple sclerosis, all had urodynamically proven detrusor overactivity which was managed with either anticholingeric agents or intravesical botulinum toxin in order to achieve a functional bladder capacity to allow intermittent drainage. The device was sized to the individual patient and fitted with a custom emptying, or 'docking' tube; all participants were given prophylactic gentamicin at bladder button insertion. The participants were either treated with intravesical botulinum toxin or anticholingergic therapy as part of their routine clinical care in order to achieve a functional bladder capacity in excess of 150mL without leakage as measured at urodynamic evaluation. The participants were then followed up over the following three years and regularly assessed with flexible cystoscopy as part of their standard clinical care.

Results

The flow rate at emptying was limited by the internal bore of the device and this meant that complete emptying required approximately two minutes on average. Although not considered to be a major issue, future designs could certainly improve on this feature.

On inspection of the intravesical mucosa at flexible cystoscopy we found that all participants bladders appeared healthy, and there was no typical 'catheter reaction' on the contra-lateral side of the bladder. This is likely due to the absence of the irritating catheter tip seen in traditional Foley catheters.

Discussion

We describe the use of a long-term gastrostomy button allow intermittent drainage of the neuropathic bladder. When combined with anticholingergic or intravesical botulinum toxin pharmacotherapy it may offer a more acceptable alternative to the conventional indwelling Foley catheter. In our small cohort we report a high degree of patient satisfaction and compliance, and

that the flushing action at drainage may confer protective advantages such as reduced blockage and infection. There is enormous scope for improvement in the device itself, including wider lumen, improved valves allowing easier manipulation and device life.

In all cases the participants were extremely satisfied with the improved cosmetic appearance and the intermittent drainage offered by this device, in particular the participants appreciated the absence of external tubing and collection devices as this allowed clothing such as beach-wear to be worn without embarrassment. All participants continue to use the supra-pubic bladder button as their preferred bladder drainage modality.

In contrast to previous reports, we fitted either size 16Ch or 18Ch lumen devices. The Medicina PEG devices are available in standard lengths in 0.5cm increments. We found that the optimal length allowed approx 0.5-1cm of axial movement within the stoma whilst the patient was sitting. This extra-length helped to avoid skin pressure and mechanical induced inflammation around the tract entry site, and unexpectedly the additional length allowed the device to slide in and out of the stoma tract without any leakage of urine. Device changes were typically performed at approximately three to six month intervals, the longest period being nine months, with one patient able to change their own device. In general device changing was unproblematic, though with the longer devices reinsertion could prove difficult, requiring a plastic intra-luminal introducer. At device change we did not observe any encrustation of the lumen of the device, which may be a result of the flushing action at intermittent drainage. There were other potential benefits of this intermittent flushing action; it was noted that at drainage debris was seen to pass through the device without blocking, a potential benefit over the traditional Foley catheter, furthermore we did not encounter any instances of symptomatic urinary tract infection, though clearly with such a small study no conclusions can be drawn.

The participants found that their patterns of usage varied, they generally used a 'voiding by the clock' approach to ensure their bladder was regularly emptied thus avoiding leakage and high bladder pressures. They also reported that they would occasionally connect the emptying tube to a collection bag to allow continuous drainage when more convenient, for example, during long meetings or when travelling or during the night. For routine intermittent drainage the device's locking pin proved to require a high degree of manual dexterity to negotiate, especially due to the distal (supra-pubic) location of the device, making direct visualisation difficult, potentially a problem for patients with limited dexterity. We therefore supplied the participants with two types of drainage tube, one which allowed easy drainage, and a further tube which could be docked and locked to a collection device. We observed some wear after 6 months use on the silicon rubber duck-bill valve due to repeated insertion of the drainage tube connector.

Conclusion

The 'bladder button' in the overactive bladder is a concept that merits further study and refinement; in the long-term it may prove to be a favoured alternative to the indwelling Foley catheter in this cohort of patients. Gastrostomy buttons are not designed for this application but have been useful to explore the possibilities. There is enormous scope for improvement in the device itself to allow easier manipulation, extend device life or even incorporate sensors to monitor intravesical pressure traces; to provide a trigger for conditional neuromodulation, or adding biofeedback mechanisms which could be used to alert patients to a full bladder or modulate pharmacotherapy.

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