Endoscopic management of buried bumper syndrome using the Balloon Dilation Pull (BDP) technique: a multicenter analysis

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Abstract

Background and study aims: **Buried bumper syndrome (BBS) may complicate percutaneous endoscopic gastrostomy placement. In these patients, endoscopic treatment ought to be considered. Various approaches have been published, ranging from dissection-based techniques to novel dedicated devices, although the evidence supporting the use of the Balloon Dilation Pull (BDP) technique has been limited to single case reports. The aim of this paper is to assess the feasibility, efficacy and safety of the systematic use of the BDP-technique for the endoscopic treatment of BBS.**

Patients and methods: **We performed a retrospective multicenter analysis of prospectively collected data from all patients treated with the BDP-technique between January 2011 and November 2021.**

Results: **In total, 26 patients were identified (median age 72 (SD ± 13) years, 74% male, 84.6% underlying neurological disease). Technical success was achieved in 92.3%, with a median procedure time of 17.5 minutes (range 5-27). Adverse events were identified in 3.8% of patients (N=1, aspiration, ASGE lexicon severity grade: moderate).**

Conclusions: **Our experience suggests that the BDP-technique is highly efficacious and safe, using accessories readily available in every endoscopic unit. Given the limited procedure time and tools required, this procedure has the potential to further optimize patient care in the context of BBS.** (Acta gastroenterol. belg., **2023,** 86, **5-9**).

Keywords: Buried bumper management, PEG tube, PEG-J, gastrostomy feeding.

Alphabetical list of abbreviations: ASGE, American Society of Gastrointestinal Endoscopy; BBS, Buried bumper syndrome; BDP-technique, Balloon Dilation Pull technique; CT scan, Computed tomography scan; PEG, Percutaneous endoscopic gastrostomy; SD, Standard deviation.

Introduction

Introduced in the 1980s, the development of the Percutaneous Endoscopic Gastrostomy (PEG) has revolutionized long-term enteral feeding for patients in whom oral feeding has become impossible or undesirable (1-3). Typically used in patients with swallowing disturbances, PEG-feeding has been used in oncological disease, for example head and neck tumors, as well as following cerebrovascular events (4,5). Whilst this approach has been proven extremely useful to facilitate enteral feeding, it has also been associated with significant morbidity and mortality (5). The Buried Bumper Syndrome (BBS) was first described in the 1990s and is a rare complication of PEG placement. The reported incidence in literature ranges from 0.3% to 2.4% (1-4,6-12). The main etiological factor leading to BBS, is excessive traction between the external and internal bumper of the PEG-tube causing ischemia, necrosis and ulceration of the overlying gastric mucosa (1-4, 6-12). This eventually may lead to partial transmural migration, where the bumper is still partly visible from within the gastric lumen (incomplete BBS), or to a complete migration through the gastric wall (complete BBS) (2,3). The internal bumper can dislocate to anywhere along the PEG-tract: from the gastric mucosa to the skin surface. Risk factors for excessive traction are poor wound healing, overweight or rapid weight gain due to adequate enteral feeding, chronic cough, manipulation by unexperienced nursing staff and insertion of gauze under the external bumper (1-4,6-12).

Clinical symptoms vary greatly, ranging from abdominal discomfort to leakage around the gastrostomy (1-4,6-12). Whilst a completely buried bumper is easily recognized during endoscopy, we should be aware of early signs of BBS. These may include development of pressure ulcers below the internal bumper and hypertrophic gastric mucosa covering the edge of the disc (2). Computed tomography (CT) imaging can aid in diagnosing BBS, but may also aid in ruling out local complications (4,8,9). Regarding endoscopic salvage techniques, dedicated devices have recently been developed (2). However, these techniques tend to rely on tedious incision-based bumper removal and availability of these specifically designed tools may be an issue. Making use of only a guidewire and an 18mm standard through-the-scope balloon dilator, the Balloon Dilation Pull (BDP) technique was first described in the early 2000s (10,12). The simplicity and low cost may make this approach an attractive therapeutic option. Many different strategies for endoscopic treatment have been published,

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whereas the supporting evidence in the context of the BDP-technique has been limited to case reports.

The aim of this paper is to assess the efficacy and safety of the BDP-technique for endoscopic treatment of BBS, using a retrospective multicenter design.

Methods

Patients and definitions

The current study is a retrospective analysis of prospectively collected data from three Belgian referral centers. Data were collected from all patients who received treatment with the BDP-technique between January 2011 and November 2021. The procedures were performed by experienced interventional endoscopists.

Technical success was defined as a successful completion of the procedure, using only the accessories intended for use during the BDP-technique (see below). Adverse event (AE) severity was graded using the American Society of Gastrointestinal Endoscopy (ASGE) lexicon (13).

The study was approved by the AZ Sint-Jan Bruges Ethical Committee (EC AZ Sint-Jan Brugge, 2021/2890).

Procedure

The BDP-technique was first published by P. Strock et al. and P. Christiaens et al. in 2005 and 2014, respectively (10,12). The paper by P. Christiaens et al. also contains a video of the procedure (https://www.sciencedirect.com/science/article/pii/S0016510714014242?via%3Dihub#appsec1).

The PEG-tube is cut off at the cutaneous side, at about 1-2cm from the skin, and fixed by either forceps or manually. Subsequently, a guidewire (0.025 or 0.035 inch, 450 mm) is advanced into the stomach through the trimmed PEG-tube, which is then picked up by a standard polypectomy snare. In case only a regular gastroscope is available, the wire can be exteriorized and back-fed into the gastroscope, which is then reintroduced. Whereas the wire can be pulled through the gastroscope if a therapeutic gastroscope (or duodenoscope) is used, without the need for wire exchange (Figure 1).

In case of a complete BBS, it can be challenging to advance the floppy tip of the guidewire into the gastric lumen. In this specific context, intragastric access can be made easier if first a stiff metal paracentesis needle is advanced through the bumper into the stomach or if the stiff end of the guidewire is used (Figure 2).

After the guidewire has been properly advanced through the working channel, a dilation balloon (size 15-18mm) is advanced over the guidewire through the scope and the PEG-tube (Figure 3). Care should be taken to advance the balloon not too far into the trimmed PEG-tube, as this may complicate bumper removal and potentially lead to soft tissue trauma. Conversely, if the balloon is not advanced far enough beyond the bumper, balloon insufflation will cause the balloon to expel itself out of the bumper. After the balloon is placed

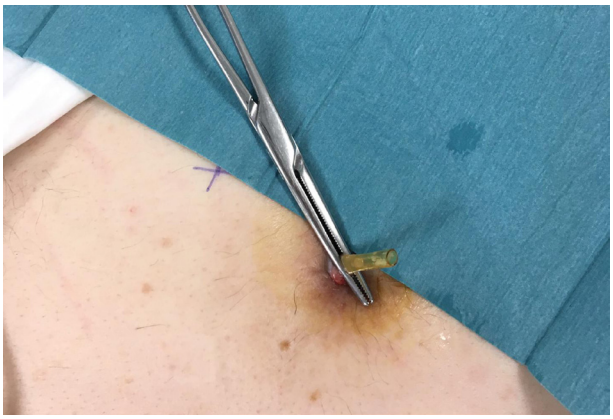

Figure 1. — The PEG-tube is cut off at the cutaneous side at about 1-2cm.

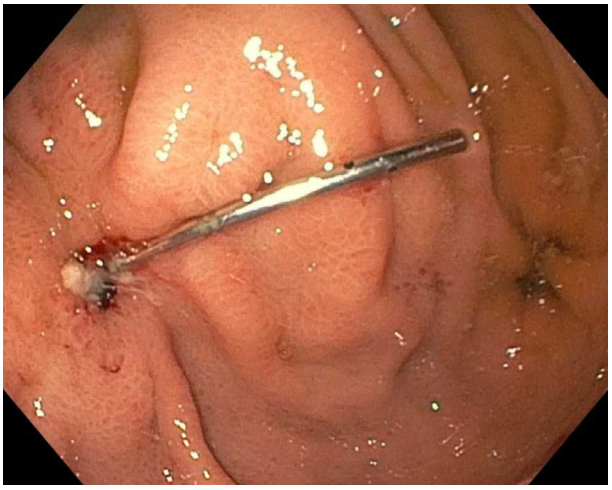

Figure 2. — In case of complete BBS, first a new entry site is made with a stiff metal paracentesis needle through the PEG-tube or the stiff end of the guidewire can be used to access the gastric lumen.

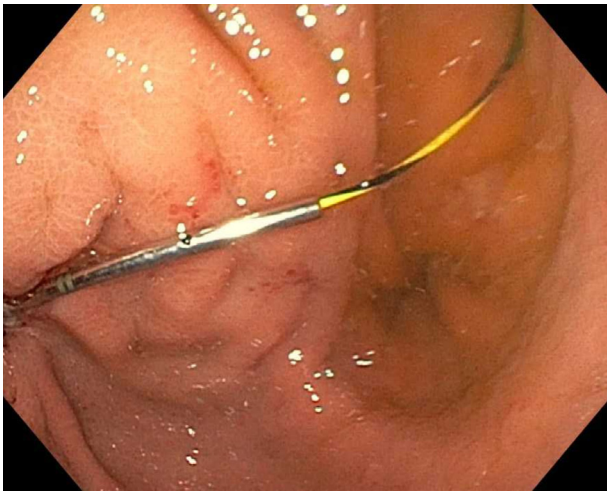

Figure 3. — A 0.035-inch guidewire is advanced into the stomach through the PEG-tube or the paracentesis needle.

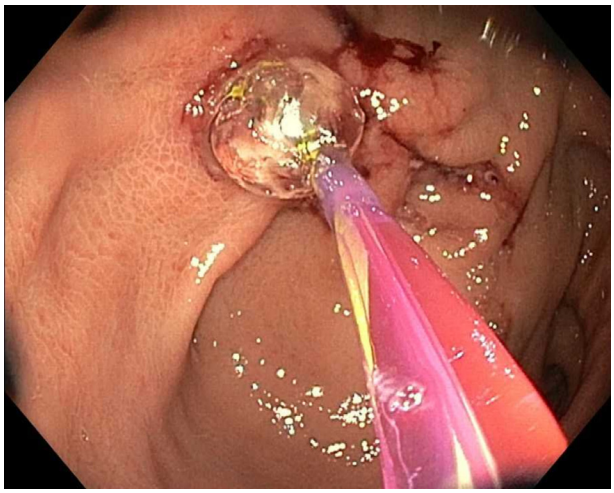

Figure 4. — A dilation balloon (size 15-18mm) is advanced over the guidewire through the scope and through the PEG-tube. By inflating the dilation balloon to the maximum dilation pressure, the balloon stays solidly impacted into the PEG-tube.

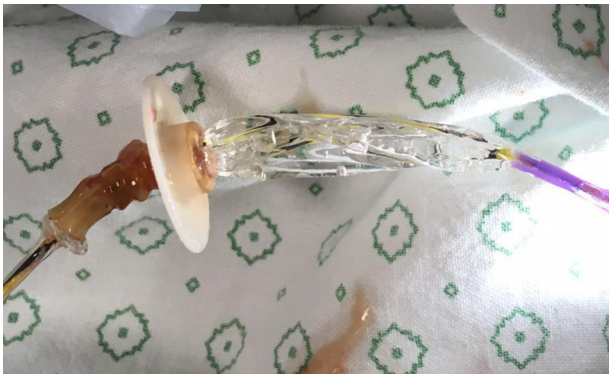

Figure 5. — The buried bumper can be mobilized from the gastric mucosa by traction on the endoscope and the balloon catheter.

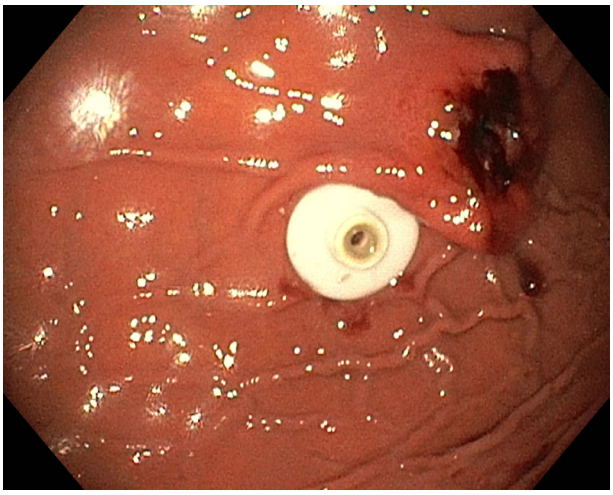

Figure 6. — In the same procedure, either a new PEG is inserted through the old trajectory or as in this case, a new PEG is inserted at some distance from the old PEG-tract.

sufficiently into the PEG-tube, it is insufflated to its maximum dilation pressure (Figure 4). This will provide a solid platform for successful mobilization of the buried bumper by continuous firm traction. Once the bumper is mobilized, the balloon and bumper are exteriorized and removed (Figure 5). Using the same guidewire, a new PEG-tube can immediately be inserted or alternatively, a new PEG-tube can be placed at some distance from the old tract (Figure 6).

Statistical analysis

Categorical variables were reported as frequencies (%) and were compared through either Fisher's exact test or Pearson Chi-squared test. Continuous variables were reported as means or median with standard deviation (SD) or range respectively and were compared using the unpaired t-tests or Mann-Whitney's U-test. The reported analyses were performed in the intention-to-treat population.

Results

A total of 26 patients were identified in the three Belgian centers (Table 1). The majority of patients were male (N=19, 74%), with a median age of 72 years (range 30-88). The indication for initial PEG placement was swallowing disturbances due to neurological condition in 22 cases (84.6%), head-neck cancer in 3 cases (11.5%) and recurrent aspiration pneumonia – not due to neurological condition – in 1 case (3.8%). The mean PEG dwell time was 24.7 months (range 0.3-77).

Based on local preferences, the endoscopic procedure was performed under deep sedation with anaesthetic support in 8 cases (31%), under light midazolam-based sedation in 19 cases (73.1%) and in 1 case (3.8%) without any sedation at all.

In cases were procedure time was available (N=8, 31%), the median procedure time was 17.5 minutes

Table 1. — **Baseline characteristics and outcomes of the BDP-technique for BBS**

BASELINE CHARACTERISTICS	
Sex (Male, %)	73.1 (N=19)
Age (Median, years)	72 (30-88)
Underlying pathology (%) • **Neurological condition** • **Head and neck cancer** • **Other**	 80.8 (N=21) 11.5 (N=3) 3.8 (N=1)
Antibiotic use (%)	30.8 (N=8)
Sedation modality (%) • **General anesthesia (with intubation)** • **Light sedation** • **No sedation**	 30.8 (N=8) 65.4 (N=17) 3.8 (N=1)
OUTCOMES	
Technical success rate (%)	92.3 (N=24)
• **Conversion to surgery (%)**	7.7 (N=2)
• **Procedure time (Median, minutes)**	17.5 (5-27)

(range 5-27). Technical success was achieved in 24 cases (92.3%); in only 2 cases the procedure had to be converted to surgery, to successfully release the internal bumper.

No procedural complications, such as pain or bleeding, were noted. One episode of aspiration pneumonia occurred (3.8%, ASGE lexicon severity grade: moderate). In one other patient (3.8%), a brief and self-limited, local oozing at the insertion site was seen, which was not recorded as an adverse event.

In two out of three centers (N=8, 31%), prophylactic antibiotic treatment was administered (31%). The other patients received no antibiotic prophylaxis and no infectious complications were noted.

Discussion

In this Belgian multicenter study, we evaluated the BDP-technique for the endoscopic management of BBS. A total of 26 patients were treated between January 2011 and November 2021, showing high technical success rate (92.3%) and low procedure times (17.5 minutes, range 5-27), at the cost of little adverse events (N=1, 3.8%, ASGE lexicon grade moderate).

Techniques in which extraction of the buried cannula is followed by a simultaneous pull-through of the new system, were already described in the early 2000s. The push-pull methods have been widely published, sometimes with modifications. In the push-pull T-technique for example, the impacted inner bumper is released by simultaneous traction with a polypectomy snare and support using a surgical clamp (2,7,11).

On the other hand, several incision-based techniques have been published such as the use of a needle knife or the so-called Flamingo device. These techniques are used when the push-pull method fails or in combination. However, potential disadvantages include a risk of serious bleeding or perforation of the gastric wall, the need for tedious incision-based removal and device costs (2,6).

In case the internal bumper cannot be mobilized endoscopically or is migrated further along the PEG-tract, surgery is sometimes the only treatment option (2-4,6-10). In this case series, two patients (7.7%) required rescue surgery because the internal bumper could not be released endoscopically.

A few preventive measures are to be considered after PEG placement. Firstly adequate positioning of the external bumper is important. Immediately after PEG placement, the length of the stoma channel should be measured at the skin surface and noted down for future comparison. After maturation of the PEG tract (10-14 days), the external bumper can be loosened at a distance of 5-10mm between the skin and the external fixator, to prevent excessive traction to the inner bumper. Putting gauze between the external bumper and the skin should be avoided. Secondly, correct daily care of the PEG tube by patients and nursing staff is to be addressed in which both oral and written information is crucial. The external bumper should be daily unfastened, followed by inserting the PEG-tube over 3-4 centimeters into the gastric lumen and turning 360° round its longitudinal axis. This technique is called the 'PEG twirl sign' and is however not suitable for balloon catheters and PEG-J (3,4,8,9).

Furthermore, the preservation of adequate nutritional support remains crucial. With the BDP-technique, a new PEG-tube is inserted in the same procedure, facilitating immediate restart of enteral feeding.

Limitations of the current study include the limited sample size, which we tried to remediate by applying a multicenter approach. Due to the relative rarity of BBS, we believe that chances of obtaining randomized prospective data are low. Therefore, series such as the current study may actually present the best evidence to date, especially using this specific technique. Secondly, no comparator group was included, making comparisons to alternative treatments difficult. The current study also carries several advantages, as no other series evaluating the BDP-technique have been published to date. Furthermore, we used a standardized technique which was identical throughout the patient population (12). And lastly, we evaluated this technique using different methods of sedation, suggesting that this technique can be used in a variety of clinical settings.

In conclusion, our data suggest that the BDP-technique is highly efficacious and safe, using accessories readily available in every endoscopic unit. Given the limited procedure time and low costs, this procedure has the potential to further optimize patient care in the context of BBS.

Funding

None.

Conflict of interest statement

The authors declare no competing interests.

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