

Is the Buried Bumper Syndrome a buried problem? Personal experience about a different therapeutic approach and prevention possibilities

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ABSTRACT: *Buried Bumper Syndrome (BBS) is a major complication that can occur after percutaneous endoscopic gastrostomy (PEG) placement when the system is made with a rigid internal bumper, which can only be removed endoscopically. In this case an excessive tension between the inner and outer bumper can result in gradual tube dislocation from the stomach with occlusion of the internal opening thus making it impossible to feed the patient. A BBS was found in six patients (1.6%) and was classified into three grades according to the degree of tube dislodgement. The ideal treatment of BBS consists in the endoscopic removal of the embedded tube and in the reposition of a new PEG. In our cases of deep tube dislocation, through an endoscopy we determined the presence of major bleeding and surgery was necessary in one patient.*

Malignancies, poor nutritional condition (BMI < 20 at the time of PEG placement), and rapid weight gain after PEG procedure are adjunctive risk factors in the development of BBS. In these patients it is mandatory to have good cooperation from caregivers on PEG care, and intensive clinical follow-up by the nutritional home-care team to prevent excessive tightness of the external bumper.

Endoscopic removal of a translocated PEG tube is useful only when the internal bumper has migrated only partially; in case of deeper migration into the gastric wall, the treatment of choice is a minimal surgical technique. (RINPE 2002; 20: 124-31)

KEY WORDS: *Buried Bumper Syndrome, Percutaneous Endoscopic Gastrostomy, Enteral Nutrition, Complications*

PAROLE CHIAVE: *Buried Bumper Syndrome, Gastrostomia Percutanea Per Via Endoscopica, Nutrizione Enterale, Complicanze*

INTRODUCTION

Since its introduction in 1980, the percutaneous endoscopic gastrostomy procedure has gained widespread popularity as a means of providing nutritional support to patients who cannot maintain adequate oral intake (1). In fact when the gastrointestinal tract is functional, enteral feeding is preferable to the total parenteral one because it is more physiological and can be easily done at

home by patients and their families (2, 3).

PEG tubes are developed as an alternative to surgical gastrostomy and can be inserted safely, rapidly and with lower cost than the surgical technique (4-7). However, complications following PEG placement have been reported in a wide range of cases (from 3% to 70%). They can be distinguished into major or minor and early or late onset (8-10).

Major complications have been reported in 1% to 11%

of the patients and they include gastric perforation, gastrocolic fistula, haemorrhage, peritonitis, severe wound infections, narcotising fasciitis and aspiration pneumonia (11-16).

An unusual major complication of PEG is the so-called Buried Bumper Syndrome, which consists in migration of the internal bumper into or through the abdominal wall with consequent intermittent or total blockage of the feeding tube (17). Its causes are unclear but it could be the result of enforced tightening of the feeding tube, often involving the use of the Sacks-Vine (Ross Laboratories, Columbus, Ohio) PEG system (18). This kit has got a rigid internal bumper that may cause excessive local pressure on the gastric mucosa, thus facilitating its gradual dislocation (19).

The ideal treatment for BBS is the endoscopic removal of the embedded tube and replacement of a new PEG without any surgical operation; however, major complications with the endoscopic procedure often occur (20, 21).

As there have been few reports about this complication in the last five years, this could be due to an improvement in the composition of the commercially available PEG materials, which are now softer than previous ones especially at the level of the internal bumper, thus reducing the likelihood of gastric pressure necrosis and consequent tube dislocation.

Here we report our experience with six patients who developed BBS and describe a different therapeutic approach for removing the feeding tube and provide suggestions for BBS prevention.

PATIENTS AND METHODS

A retrospective review of the medical records of 358 patients, who had had PEG placement at the Digestive Endoscopy and Gastroenterology Section of Fidenza Hospital between January 1994 and May 2001, was conducted.

At the time of the PEG procedure none of the patients were moribund but all were suffering from malnutrition because of impaired swallowing and inadequate hypocaloric oral food intake with a nutritional need for supportive enteral feeding expected to extend beyond at least three to four weeks.

The characteristics of the patients are summarized in Table I.

The patients who could not collaborate and/or were physically and mentally agitated were thought to be at high risk of PEG dislodgement. In these cases we decided to use a tube with a rigid internal bumper, which can only be removed endoscopically, to prevent the removal of the PEG by the patient himself.

The PEG procedure, which was completed in the endoscopic room in all cases, was followed by a standard protocol that included: 1) pre-operative single dosage of cephazoline intravenously; 2) sterile dressing of the puncture skin site on the abdomen; 3) sedation of the patient with midazolam if needed; 4) complete oesophago-gastro-duodenoscopy before PEG placement.

After inserting the feeding tube the external bumper was placed tightly enough to ensure the correct joining of the stomach to the abdominal wall and to prevent bleeding at the puncture site.

After insertion the internal bumper was visualised by endoscopy to assess its correct position and degree of tightness (Fig. 1). The correct degree of tightness was do-

TABLE I - CHARACTERISTICS OF THE PATIENTS AND METHODS

No. of patients: 358	Type of PEG (N°)
Gender (M/F): 195/163	– Flexiflo, Abbott (215)
Mean age (yr): 78 ± 13	– Compat Nuport, Novartis (73)
Indication for PEG:	– Fastrac, Bard (28)
– Dementia 191 (53.3%)	PEG with rigid internal bumper:
– CVA 85 (23.7%)	– 39 (10.8%)
– Malignancy 47 (13.1%)	Method of PEG placement:
– Others 35 (9.7%)	– Push: 321 (89.1%)
Body mass Index (mean):	– Pull: 25 (6.9%)
– 20.3 ± 3.7 kg/m ²	– Introducer: 12 (3.3%)
	Duration of PEG (mos): 23.8 ± 7.2



Fig. 1 - Normal position of the internal bumper into the stomach after PEG placement.

cumented by the absence of endoscopic ischaemic signs and by the possibility of rotating the internal bumper but without allowing any back and forth movement of the tube.

Postprocedure instructions required the use of an abdominal binder to prevent inadvertent dislodgement of the tube and to allow the immediate discharge of the patient from the endoscopic room if there were no sign of early complications.

Feeding, either continuous or bolus, was started within 12 to 24 hours after a slight loosening of the external

bumper to prevent excessive local pressure.

The nurses from our nutrition team routinely visited all the patients at 24 hours, 5 and 10 days and every 3 months after PEG insertion.

The surveillance protocol included the registration of the following parameters: body weight, baseline Body Mass Index (BMI) and after 1 month, quality of patient nutrition after discharge from the hospital, total duration of PEG feeding and complications.

The total complications observed are summarised in Table II.

Six patients (1.6%) presented symptoms suggesting PEG translocation: feeding tube obstruction, gastrostomy site discomfort, abdominal pain and peristomal leakage (Tab. III).

Upon examination the skin surrounding the PEG was found to be erythematous and hardened. In all cases the feeding tube could neither be rotated or advanced into the stomach and, except in one patient, the under pressure fluid injection through the PEG resulted in a reflux around the tube site.

The diagnosis of BBS was confirmed by endoscopy where the internal bumper was found to have migrated into the gastric wall.

We classified the degree of migration of the internal bumper into three grades (Tab. IV).

Three patients had partial migration of the internal bumper (Fig. 2). In these cases a guide wire was passed through the tube into the stomach cavity and an endoscopic removal was accomplished successfully by using the alligator forceps or snare.

In all patients a new 15F PEG ("Compat gastrotube" type) was inserted over the wire through the gastrocutaneous fistula, the balloon was inflated, and the guide wire was removed under endoscopic control. No dilatation of the stoma was necessary to insert the new PEG. Enteral nutrition was gradually resumed after 24 hours and no complications occurred.

All the patients had an ulcer crater caused by the internal bumper decubitus and so they were treated daily with 30 mg of non-encapsulated lansoprazole through the PEG tube for 8 weeks.

Endoscopic control after 2 months was performed in two patients (one patient did not undergo the examination because of extremely bad health conditions) and we documented the complete healing of the ulcer without recurrence of tube translocation.

Two patients had a sub-total buried gastrostomy bumper (Fig.3).

An attempt to grasp the dome with an alligator forceps was unsuccessful so, after a guide wire introduction into the stomach, we tried to expose the buried bumper using small radial incisions with a pre-cut papillotomy

TABLE II - TOTAL COMPLICATIONS IN 358 PATIENTS AFTER PEG INSERTION

Total: 41 (11.4%)

Major:

- BBS 6 (1.6%)
- Tube extrusion 4 (1.1%)
- Aspiration pneumonia 2 (0.5%)
- Peritonitis 2 (0.5%)
- Sepsis 1 (0.2%)
- GI Bleeding 1 (0.2%)

Minor:

- Wound infection 12 (3.3%)
- Local bleeding 4 (1.1%)
- Fever 3 (0.8%)
- Pain 3 (0.8%)
- Diarrhoea 3 (0.8%)

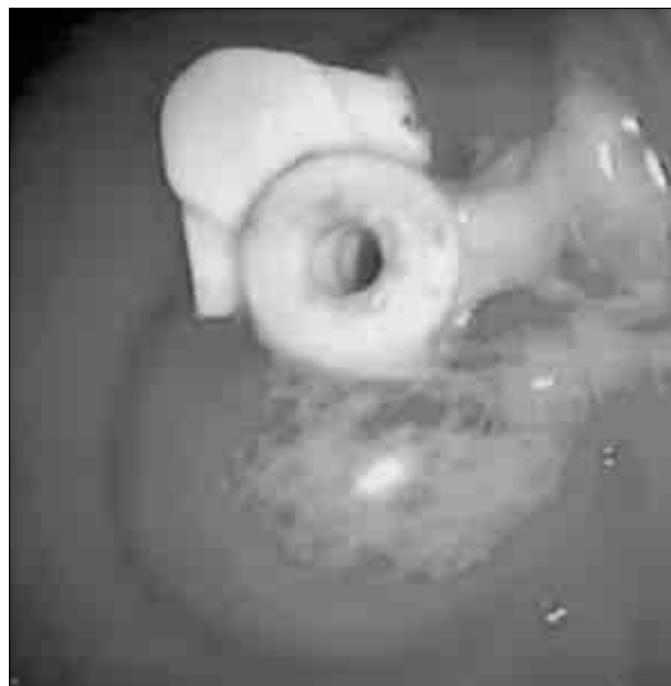


Fig. 2 - Partially buried gastrostomy bumper seen by endoscopy.



Fig. 3 - Sub-total buried gastrostomy bumpers seen by endoscopy. The inner bumpers are almost completely overgrown with hypertrophic gastric mucosa and embedded into the gastric wall. In 3a the lumen of the feeding tube is visible, in 3b the PEG lumen was not visible but introduction of the guide wire into the stomach was made possible through the feeding tube in both cases.

TABLE III - SIX PATIENTS WITH BURIED BUMPER SYNDROME: CHARACTERISTICS

Pt	QI	BP	ZR	AS	GI	PA
Age	82	79	76	71	69	66
Sex	F	F	M	M	M	M
Diagnosis	Dementia	CVA	Brain cancer	Larynx cancer	Lung cancer	Pharynx cancer
BMI (kg/m ²)	18.0	19.5	19.3	18.9	17.5	16.4
Type of PEG	Compat 22F Novartis	Flexiflo 22F Abbott	Flexiflo 22F Abbott	Flocare 18F Nutricia	Compat 22F Novartis	Caluso 22F Sandoz
RIB	Yes	Yes	Yes	Yes	Yes	Yes
Duration (mos)	15	14	2	11	4	8
Symptom	Abdominal discomfort	Abdominal discomfort, infection	Leakage	Leakage, tube obstruction	Tube obstruction	Tube obstruction
Migration degree (grade)	Partial (1°)	Partial (1°)	Partial (1°)	Sub-total (2°)	Sub-total (2°)	Total (3°)
Complication	None	None	None	Bleeding	Bleeding	Bleeding
Result	EN	EN	EN	EN	EN	Death

RIB= rigid internal bumper
EN= enteral nutrition



Fig. 4 - A completely buried bumper gastrostomy seen on endoscopy. A submucosal lesion positive for the “blind sign” was highlighted with a central depression. External traction of the tube produced a typical retraction of the anterior gastric wall.

needle-knife according to the technique described by Ma et al, but bleeding occurred (22).

In one case active arterial spurting was controlled with local injection of an adrenaline solution and subsequent endoclip application. After partial exposure of the dome we tried to use the push-pull T technique described by Boyd et al to accomplish an endoscopic PEG removal. This method requires the combined movements of endoscopic traction, after a snare has looped around a rigid tube creating a T mechanism out of the PEG, and external manual pushing finalised to the oral remove of the embedded tube (23).

The procedure achieved the oral extraction of the PEG tube but moderate arterial rebleeding occurred. In one

case the endoscopic techniques were successful to stop the spurting at the second attempt and finally, in both cases, a new PEG was placed next to the previous one after five days.

The last patient, with previous Billroth II gastrectomy, presented a completely buried bumper gastrostomy simulating a submucosal lesion (Fig. 4).

The orifice of the internal bumper, near the gastro-jejunal anastomosis, was completely covered by gastric epithelium and could be identified only by a small central depression and by passing a guide wire into the stomach.

The needle-knife technique was used to expose the internal bumper but severe bleeding occurred. An endoscopic attempt to stop the bleeding was useless and consequently urgent surgery became necessary.

A cutaneous incision on each side of the tube was made to remove the PEG and a large opening of the peritoneum was carried out to ensure good haemostasis. The patient, however, died in the second post-operative day with persistent hypotension.

DISCUSSION

PEG placement is a relatively safe procedure and complications are generally minor and easily handled (24). Buried bumper syndrome is a major complication of PEGs whose incidence in previous reports ranges from 1.6% to 6.1% (25, 26).

This discrepancy can be ascribed to various reasons. First, patients treated with long-term enteral nutrition have a high mortality rate from other co-morbid conditions, so the relatively short life-span contributes to the occasional observation of the BBS. Second, poorly designed data collection methods and the absence of a standard classification of the complication are also involved (27).

In our series four patients had their gastrostomy in place for longer than six months, but in two cases BBS was diagnosed at two and four months, respectively, after placement thus suggesting that it can be a relatively early event.

TABLE IV - CLASSIFICATION OF THE BURIED BUMPER SYNDROME

Grade	1°	2°	3°
Symptoms	- Absent or - Abdominal pain - Persistent peristomal wound infections	- Pain - Leakage - Tube malfunction	- Tube obstruction
Migration degree	Partial	Sub-total	Total
Treatment	Endoscopy	Surgery	Surgery

In comparing our six cases with the other 33 patients, with rigid internal bumper but no BBS, we observed no statistically significant differences in terms of tube, duration of PEG, method of placement and BMI.

The symptoms of BBS vary considerably and, especially when partial tube dislodgement occurs, they can be very mild or there can be no symptoms at all.

Such events, particularly when the patients cannot collaborate, there is low compliance by the family controlling the nutrition or there are too few controls by the nutritional nursing team, can cause big delays in the identification (28).

In our series BBS was suspected when peristomal leakage and/or feeding tube malfunctioning were found.

In one case the persistence of abdominal discomfort without any signs of inflammation made us perform a gastroscopy, which revealed a first grade BBS.

In most cases BBS was reported most often with the Sacks-Vine (Ross Laboratories) gastrostomy kit, which has then been taken off the market.

These kits had a rigid internal bumper made with hard plastic material, requiring endoscopic removal, with a bottom design that resulted in direct contact with the gastric mucosa of a small surface area of the dome. When too much pressure was maintained between the inner and outer bumpers, pressure necrosis and ulceration was facilitated and caused the tube to migrate slowly out of the stomach towards the anterior wall (29).

The acid environment of the stomach caused the internal bumper to become extremely brittle and hard, thus increasing the likelihood of decubitus on the mucosa (30).

In the last few years, following improvements in the composition of the materials and the design of PEGs, plastic or soft silicone tubes have been used; these tubes can be directly removed by simply pulling out the external part of the feeding tube. The possibility of changing the shape and width of the internal bumper of the latest PEGs on the market makes BBS less common and explains why recently fewer cases have been reported.

The potential disadvantage of these new PEGs is that inadvertent patients or caregivers manipulations could create an early dislodgement of the tube prior to the formation of a mature fistula tract, with disastrous leakage of nutrition compound in the peritoneal cavity (31). In fact, we had four cases (1.1%) of accidental removal of the feeding tube that required the endoscopic reposition of a new PEG.

In our series, 39 patients (10.8%) were thought to be at high risk of self extubation (the ones who could not collaborate and/or were physically and mentally agitated), so we decided to use a type of feeding tube with a rigid internal bumper, which can only be endoscopically removed. All our BBS cases examined had this type of PEG.

Potential reasons for a tight fitting external bumper include rapid weight gain, inadvertent patient manipulations or pulling of the PEG, placement of multiple gauze pads between the external bumper and the abdominal skin surface, repositioning of the external bumper by inexperienced caregivers or excessively tight placement during PEG introduction (32).

All our BBS patients suffered from severe malnutrition, BMI less than 20 at the time of PEG placement, and four patients had a neoplastic disease.

The significant and sudden increase in nutritional indexes, which occurred one month after enteral nutrition introduction, could have caused an enforced tightening of the PEG, thus predisposing towards gastric mucosa necrosis and consequent tube dislodgement in all cases.

After PEG placement, some authors have recommended leaving a 2 mm space between the external bumper and the abdominal skin surface to avoid pulling the internal bumper up tight against the gastric mucosa surface, but there is no general consensus about this practice because early loosening of the outer bumper may predispose towards increased rates of haemorrhage, pneumoperitoneum and intraperitoneal leakage (33-35).

At our institution we always perform a second endoscopy after PEG placement to confirm that the internal bumper lies comfortably against the gastric mucosa before the application of the external bumper. In particular, the correct degree of tightness is documented by the absence of endoscopic ischaemic signs and by the possibility of rotating the internal bumper without any back and forth movement of the tube.

On the following day, after slight loosening of the external bumper to prevent excessive local pressure, we start the enteral nutrition.

We now take special care in instructing the patient and caregivers on home management of the PEG and recommend them to routinely verify that the internal bumper is free and not embedded within the gastric wall. We give specific indications on how to correctly replace the external bumper with special attention to bumper tension.

Any restricted movement, leakage or peristomal pain should be promptly reported to the home-care team; if there is suspicion of BBS an early endoscopy is performed with a high probability of saving the feeding tube.

Especially the nutrition support team must be closely involved in patient care education and must be trained to discover this particular problem (36).

Although the ideal approach to BBS is to think of removing the embedded tube endoscopically without any surgical intervention, major complications like haemorrhage or perforation are reported after an endoscopic attempt (37-40).

In our three cases a deep internal bumper migration was found (2°-3° grade). In these patients an endoscopic removal attempt provoked major bleeding and one death for related causes was observed.

It is our experience that the BBS, reported almost exclusively after Sacks-Vine gastrostomy kits placement, can occur with many other PEG tubes made with a rigid internal bumper, which can only be removable endoscopically; however, these types of PEGs are indicated in self-extubation high risk patients.

Malignancies, poor nutritional condition with low BMI at time of PEG placement, and rapid weight gain after the PEG procedure are adjunctive risk factors in developing BBS. In these patients it is mandatory to have good cooperation from caregivers regarding PEG care and intensive clinical follow-up by the nutritional home-care team to prevent excessive tightness of the external bumper.

Multidisciplinary nutrition support teams are a valuable adjunct in the management of tube-fed patients. The combined expertise of such a team will likely result in better care, decreased complications and increased cost-effectiveness of enteral nutrition.

Endoscopic removal of a translocated PEG tube is useful only when the internal bumper has migrated partially (grade 1). In cases of deeper migration into the gastric wall (grade 2 or 3) minimal surgical technique is the treatment of choice.

RIASSUNTO

Gli Autori riportano la loro esperienza riguardo la Buried bumper syndrome (BBS) che è una complicanza maggiore che si può verificare dopo posizionamento di una gastrostomia percutanea per via endoscopica (PEG).

Essa è caratterizzata da un graduale dislocamento della sonda al di fuori dello stomaco con conseguente malfunzionamento della PEG e che si manifesta con sistemi che utilizzano bumper interni rigidi, rimuovibili solo endoscopicamente. Nel periodo considerato sono stati osservati 6 casi (1,6%) di BBS che sono stati classificati in 3 gradi in base al livello di dislocamento. Il trattamento ideale della BBS consiste in una rimozione endoscopica della sonda con posizionamento di una nuova PEG. Nei casi di dislocamento profondo, da noi osservati, il tentativo endoscopico di rimozione della sonda ha determinato la comparsa di episodi di sanguinamento maggiore che in un caso ha richiesto il ricorso alla chirurgia d'urgenza e ha provocato il decesso del paziente per cause correlate.

Patologie neoplastiche, scadenti condizioni nutrizionali con BMI <20, rapido aumento di peso dopo inizio della nutrizione enterale sono fattori di rischio aggiuntivi per lo sviluppo della BBS. A fini preventivi è apparso pertanto fondamentale un intenso follow-up da parte del team nutrizionale domiciliare di supporto e un buon livello educativo del paziente e dei familiari circa la gestione della PEG. Sulla base della nostra esperienza la rimozione endoscopica in caso di BBS è indicata solo nelle migrazioni parziali (1° grado), mentre in caso di dislocamento più profondo (2°-3° grado) la soluzione ottimale è rappresentata dal trattamento chirurgico.

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