

# Buried Bumper Syndrome

## Early or Late?

### ABSTRACT

Buried bumper syndrome (BBS) is a rare and serious complication of percutaneous endoscopic gastrostomy (PEG) tube placement. In the literature, BBS is considered to be a late complication of PEG procedure, but it may occur in the early period after PEG tube placement. Early diagnosis and proper treatment are important. Different treatment modalities may be used to treat BBS. The aim of this study was to evaluate patients with BBS. During a time frame between January 2015 and February 2020, a hospital medical database was screened for PEG placement and BBS. Buried bumper syndrome was found in 36 patients. Demographic and clinical characteristics of these patients were retrospectively investigated. Those who developed BBS in the first month were evaluated as early BBS. Those who developed BBS after more than a month were evaluated as late BBS. The median BBS development time was  $135.9 \pm 208.1$  days (9–834 days). In 18 (50%) patients, BBS developed within the first month. Serious complications such as abscess and peritonitis were observed in 8 (22.2%) patients on admission. Thirty-two (88.9%) of 36 patients were treated with external traction and four patients were treated with surgery. No complications were observed in patients who were treated with traction. Five patients died, of whom three of them died because of BBS complications, whereas two of them died from other causes unrelated to BBS. Buried bumper syndrome is a complication that can be seen in the early period after gastrostomy. External traction is a reliable method for treating these patients. Proper education of patients' relatives and caregivers is very important to prevent BBS and related complications.

Percutaneous endoscopic gastrostomy (PEG) was first described in 1980 by Ponsky and Gauderer. Since its introduction, PEG has become the preferred method of feeding in patients who require long-term enteral nutrition (Gauderer, Ponsky, & Izant, 1980; Rahnama-Azar, Rahnamaiazar, Naghshizadian, Kurtz, & Farkas, 2014). While generally considered to

be safe, there are some serious life-threatening complications related to PEG tube placement (Lee & Lin, 2008; Rahnama-Azar et al., 2014).

### Background

Buried bumper syndrome (BBS) is a rare but serious complication of PEG tube placement. This syndrome is

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defined as a partial or complete overgrowth of the gastric mucosa, covering the internal bolster. This complication occurs when the internal bumper of the PEG tube erodes and migrates through the gastric wall. Although the cause of BBS is not known exactly, it is believed that BBS occurs as a result of excessive tension between the internal and external bumpers. The prevalence of BBS is reported as 0.3%–2.4% (El et al., 2011; Lee & Lin, 2008; Rahnama-Azar et al., 2014; Venu, Brown, Pastika, & Erikson, 2002). Treatment of BBS is removal of buried tube by external traction, endoscopically or surgically (Rahnama-Azar et al., 2014). The aim of this study was to evaluate demographic and clinical characteristics of BBS patients and compare early and late BBS.

## Patients and Methods

This retrospective study was conducted at the Adana City Research and Education Hospital Gastroenterology Clinic, between January 2015 and February 2020. Endoscopy unit and hospital computer databases were screened retrospectively. All patients who had undergone endoscopy or PEG procedure were evaluated as to whether they had BBS or not. Patients with BBS were included in the study. Buried bumper syndrome is defined in this study as migration of the internal bumper of a PEG catheter from the gastric wall alongside a gastrostomy tract (McClave & Jafri, 2007).

Patients' demographic, clinical, and laboratory characteristics were recorded. Percutaneous endoscopic gastrostomy indication, symptoms on admission, time interval from PEG placement to BBS diagnosis, complications, and applied treatment were recorded. Introduction of a new PEG tube placement in the same session was also recorded.

Patients with BBS were grouped into two groups according to the time interval between PEG placement and BBS development. Patients with BBS that occurred in less than a month were evaluated as those with early BBS, and others were evaluated as those with late BBS.

The PEG procedure was applied in our clinic to all patients as follows: All patients or patients' relatives gave written informed consent. Intravenous 1-g cefazolin was given to all patients 30 minutes prior to the PEG procedure. The PEG procedure was performed according to pull technique while using the negative aspiration test (Gauderer et al., 1980).

## Statistics

Categorical data are presented as numbers and percentage whereas continuous data are reported as means and standard deviation. All statistical analysis was performed by using IBM SPSS Statistics for Windows, version 22 (IBM Corp., Armonk, NY).

Distribution of continuous variables was analyzed by the Kolmogorov–Smirnov test. Distribution of continuous variables, which were not distributed normally, were analyzed by the Mann–Whitney *U* test. Student *t* test was used for continuous variables, which were distributed normally. Calculated *p* values < .05 were accepted as statistically significant.

## Results

During the study period, 686 PEG procedures were performed in our clinic. Of these patients, BBS was observed in 25 (3.6%) patients. The remaining 11 (30.6% of all patients with BBS) patients had undergone PEG procedure in different institutions. Buried bumper syndrome was observed in 14 (37.8%) men and 22 (61.1%) female patients. The median age of the patients was  $68.9 \pm 14.6$  years. Eleven (30.6%) patients had another PEG tube placement in the same session after external traction.

The indications for gastrostomy tube insertion were different and included mainly cerebrovascular disease and Alzheimer's disease. The most common complaints on admission were failure to feed and purulent discharge from the PEG insertion site. Abscess and peritonitis were the most common findings. Among those patients with BBS, 32 (88.9%) patients were treated with external traction. There were no complications related to external traction observed in patients treated with this method. Four (11.1%) patients were treated with surgery. In all BBS patients, death was observed in five (13.9%) patients, three of them (8.3%) secondary to BBS complication. Three patients who died had an abdominal abscess related to BBS. One patient who had an intracerebral mass had sudden death with no complications related to BBS. The last patient who had decubitus ulcer, sepsis, and acute renal failure died because of sepsis. Demographic and clinical data of all BBS patients are shown in Table 1.

In 18 (50%) patients, BBS developed within 1 month, and for the shortest time in our study, BBS was observed 9 days after PEG placement. The median BBS development time was  $135.9 \pm 208.1$  days (9–834 days). In the early BBS group, median development time of BBS was  $22.2 \pm 7.3$  days (9–31 days). In the late BBS group, median development time of BBS was  $249.7 \pm 248.3$  days (40–834 days). Comparison of early and late BBS groups is shown in Table 2.

## Discussion

As life spans increase, the incidence of cerebrovascular accident (CVA), dementia, and malignant diseases increases. Malnutrition due to these diseases and other concomitant conditions is common. Percutaneous endoscopic gastrostomy is widely used to provide

**TABLE 1.** Patient Characteristics and Comparison of Patients According to Time Interval of BBS Development

Parameter	All Patients (n = 36)	Early BBS (n = 18)	Late BBS (n = 18)
Age (mean $\pm$ SD), years	68.9 $\pm$ 14.6	72.6 $\pm$ 12.7	65.2 $\pm$ 16.7
Gender, n (%)			
Male	14 (38.9)	5 (27.8)	9 (46.3)
Female	22 (61.1)	13 (72.2)	9 (50)
Etiology, n (%)			
CVA	19 (52.8)	10 (55.6)	9 (50)
Dementia	6 (16.7)	3 (16.7)	3 (16.7)
Combined CVA and dementia	2 (5.6)	1 (5.6)	1 (5.6)
Cancer	2 (5.6)	2 (11.1)	0
Other	7 (19.4)	2 (11.1)	5 (27.8)
Symptom, n (%)			
Unable to feed	32 (88.9)	17 (94.4)	15 (83.3)
Discharge from PEG insertion site	16 (44.4)	6 (33.3)	10 (55.6)
Erythema around PEG insertion site	12 (33.3)	4 (22.2)	8 (44.4)
Other	4 (11)	1 (5.6)	3 (16.7)
BBS development time (days)	135.9 $\pm$ 208.1	22.2 $\pm$ 7.3	249.7 $\pm$ 248.3
Complication, n (%)			
Abscess	7 (19.4)	4 (22.2)	3 (16.7)
Peritonitis	1 (2.8)	0	1 (5.6)
Death	5 (13.5)	2 (11.6)	3 (16.7)
BBS related	3 (8.3)	1 (5.6)	2 (11.1)
BBS unrelated	2 (5.6)	1 (5.6)	1 (5.6)
Treatment		76 (41.8)	51 (47.2)
External traction, n (%)	32 (88.9)	16 (88.9)	16 (88.9)
Surgery, n (%)	4 (11.1)	2 (11.1)	2 (11.1)
Reinsertion of new PEG tube in the same session after traction			
Yes	11 (30.6)	4 (22)	7 (38.9)
No	25 (69.4)	14 (77.8)	11 (61.1)

Note. BBS = buried bumper syndrome; CVA = cerebrovascular accident; PEG = percutaneous endoscopic gastrostomy.

enteral nutrition in these patients (Bischoff et al., 2020; John, Bullock, Brenner, McGaw, & Scolapio, 2013). This method is preferred to surgical gastrostomy because it is effective and safe. It has a low complication rate, is cost effective, and inserted in a shorter period of time (Bischoff et al., 2020; Hucl & Spicak, 2016). This method is widely used today to provide enteral nutrition (Hucl & Spicak, 2016). In our study, most of the patients who developed BBS were geriatric patients. The most common indications for PEG were CVA and dementia.

Percutaneous endoscopic gastrostomy is a relatively safe and easily-applied method for feeding patients who cannot take food via the oral route. However, it can be associated with serious complications. Buried bumper syndrome is one of the most important complications related to PEG tube placement. Buried bumper syndrome is defined as the migration of the internal bumper along the stoma tract toward the skin. Poor wound healing (because of steroid therapy, malignancy, chemoradiation therapy, or malnutrition), significant weight gain in response to enteral feeding,

**TABLE 2.** Comparison of Groups According to Age and Laboratory Values

Parameter	All Patients (n = 36)	Early BBS (n = 18)	Late BBS (n = 18)	p
Age (Mean ± SD), years	68.9 ± 14.6	72.6 ± 12.7	65.2 ± 16.7	<.05
WBC (/μl)	10164 ± 43.52	9895 ± 3704	10467 ± 5106	>.5
Hgb gr/dl	12.6 ± 5.8	11.5 ± 1.2	13.9 ± 8.3	>.5
Plt (/μl)	282531 ± 77019	297764 ± 90642	266400 ± 56750	>.5
Alb (g/dl)	3.2 ± 0.7	3.2 ± 0.7	3.2 ± 0.6	>.5
Glucose (mg/dl)	136.2 ± 45.7	140.4 ± 47.2	131.8 ± 45.3	<.05
AST (U/L)	41.0 ± 44.1	35.1 ± 38.6	47.2 ± 49.8	<.05
ALT (U/L)	37.1 ± 47.3	32.9 ± 41.0	41.6 ± 54.1	<.05
Bil (mg/dl)	0.6 ± 0.5	0.5 ± 0.2	0.7 ± 0.7	>.5
ALP (U/L)	83.0 ± 27.3	81.1 ± 15.9	84.2 ± 33.2	>.5
Urea (mg/dl)	69.5 ± 63.7	54.3 ± 24.9	86.7 ± 87.7	>.5
Cr (mg/L)	0.9 ± 0.8	0.7 ± 0.4	1.1 ± 1.1	>.5
Na (mmol/L)	138.1 ± 4.9	138.5 ± 3.8	137.7 ± 6.0	>.5
K (mmol/L)	4.3 ± 0.9	4.5 ± 0.9	4.2 ± 0.8	>.5
CRP (mg/L)	20.0 ± 41.4	22.2 ± 7.2	34.2 ± 55.6	<.05

Note. Alb = albumin; ALP = alkaline phosphatase; ALT = alanine aminotransferase; AST = aspartate aminotransferase; BBS = buried bumper syndrome; Bil = Bilirubin; Cr = Creatinine; CRP = c-reactive protein; Hb = hemoglobin; K = potassium; Na = Sodium; Plt = Platelet; WBC = white blood cells.

excessive tension between the internal and external bolsters, or inadvertent tugging on the tube (by a patient who has altered mental status) may also contribute to the formation of BBS (McClave & Jafri, 2007). Symptoms of BBS are abdominal pain during feeding, difficulty in feeding, peristomal leakage, peristomal bulging, stomal wound pain, and outward erosion of the internal bumper (Lee & Lin, 2008). The most common symptoms in our patients were difficulty in feeding, purulent discharge from the PEG insertion site, and erythema around the PEG insertion site.

Although endoscopy is used most frequently in BBS diagnosis, computed tomography and other imaging methods are generally used to identify accompanying complications (Cyrany, Rejchrt, Kopacova, & Bures, 2016). Malnutrition, poor wound healing, excessive tension between the internal and external bolsters, significant weight gain after PEG placement, lack of attention to the stoma site, and signs/symptoms of BBS are risk factors of BBS development (Toussaint, Van Gossum, Ballarin, & Arvanitakis, 2015). Recognition of the complications and the use of preventive strategies, such as checking of the PEG tube position, leaving a small distance between the external bumper and the skin, and daily rotation of the tube in the first week of the placement, are very important efforts for preventing BBS (Biswas, Dontukurthy, Rosenzweig, Kothuru,

& Abrol, 2014; Toussaint et al., 2015). In addition, training of the caregiver and the relatives of patients must be encouraged. Without early diagnosis and appropriate treatment of BBS, serious complications related to PEG such as peritonitis, abdominal abscess, and even death may occur as in our patients (El et al., 2011). In our BBS patient group, seven patients had abscesses and one had peritonitis. Three of them died because of these complications.

In the literature, BBS is considered to be a late complication of PEG tube placement, but it may occur shortly after (Anagnostopoulos, Kostopoulos, & Arvanitidis, 2003; Lee & Lin, 2008). Lee and Lin (2008) have reported the prevalence of BBS as approximately 8.8% and the median interval time for PEG placement to BBS development as 18 months. Although El et al. (2011) reported a similar median interval time between PEG insertion and BBS diagnosis as 22 months in eight patients, they found its prevalence as 0.9% in 879 PEG placements. Their low BBS complication rate was due to proper follow-up and preventive measures applied after PEG insertion (El et al., 2011). In our study, we have detected 25 BBS patients in 686 PEG procedures so that the prevalence of BBS was 3.6%. This prevalence may be higher because of the patients who were lost to follow-up or admitted to other clinics.



Early BBS formation as early as a month (Biswas et al., 2014; Curcio et al., 2014; Geer & Jeanmonod, 2013) and even in the first 10 days (Afifi et al., 2016; El et al., 2017; Geer & Jeanmonod, 2013) has been reported. In the literature, a BBS case occurring as early as 3 days has been reported (Azevedo, Caldeira, & Banhudo, 2018). Half of our cases had early BBS, and the shortest time interval for BBS was 9 days.

The treatment of BBS has not been standardized, and it is dependent on the patient's status as well as the clinicians' experience. Different endoscopic and surgical approaches have been described in the treatment of BBS (Binnebosel, Klink, Otto, Schumpelick, & Truong, 2010; Lee & Lin, 2008; Rieder & Pfeiffer, 2008). External traction as well as endoscopic and surgical methods are used to treat BBS. Removing the buried tube by external traction is a very effective method and has fewer complication rates (Lee & Lin, 2008). External traction is the best method for PEG tubes that have the dome-shaped internal bumper (Lee & Lin, 2008). This method is suitable for patients without peritonitis (Lee & Lin, 2008). However, when it cannot be removed by traction, endoscopic treatment is primarily preferred over surgical treatment, and there are many different endoscopic treatments available (Lee & Lin, 2008).

In a study conducted by Lee and Lin (2008), the buried tube was removed by external traction in 19 patients with BBS, and there were no significant complications. In a similar study carried out by Rieder and Pfeiffer (2008), the buried tube was removed by using Savary–Gilliard bougies with or without a needle knife in 12 patients with BBS. In one patient, the needle-knife procedure caused bleeding, which was treated endoscopically (Rieder & Pfeiffer, 2008). In a recent study by Mueller-Gerbes, 82 patients were included in the study. Seventy-eight (95%) of them were treated endoscopically using a papillotome, needle knife, bougie, or grasper. Only four (4.9%) patients underwent surgical treatment (Mueller-Gerbes et al., 2017). Currently, new endoscopic treatments continue to be offered in the treatment of BBS (Costa, Despott, Lazaridis, Koukias, & Murino, 2019; Lazaridis, Murino, Telese, Koukias, & Despott, 2019; Nakamura, Kikuchi, Ohnuma, Hirakawa, & Kato, 2019; Peck, Sapp, Wilsey, & Wilsey, 2019).

In our retrospective study, 32 patients (88.9%) were treated with external traction. There were no complications related to traction observed in patients treated with external traction. Only four (11.1%) patients underwent surgical intervention. Most of the PEG tubes used in our hospital are dome bolstered-type tubes. These PEG types are supplied exclusively in our hospital. Most of the patients coming from other locations may have used dome bolstered-type catheters. Bolstered type-catheters

are soft and foldable tubes. Bolstered type-catheters can be easily removed with traction. Half of our patients had early BBS; thus, the traction could be applied to most of these cases easily because the fistula tract was not fully matured. Gastrocutaneous tracts usually mature in 2 weeks, but in elderly patients with accompanying malnutrition, this time may be prolonged up to 4 weeks (McClave & Jafri, 2007). In early BBS patients, due to an immature gastrocutaneous tract, early withdrawal of a PEG tube may prevent infection of the abdominal wall. Without maturation of the fistula tract, peritonitis due to leakage from the immature gastrocutaneous fistula may develop (Libanio & Pimentel-Nunes, 2018; McClave & Jafri, 2007). We have no patients who had peritonitis related to external traction.

After the treatment of BBS, placing a new PEG tube is important (Kejariwal, Aravinthan, Bromley, & Miao, 2008). It is important to determine whether the PEG site is salvageable and whether it may be reused for the placement of a new PEG. The site may not be salvageable if the surface area of the enlarging hole around the PEG is too large or if the defect in the muscular wall of the stomach and anterior abdomen is too large (McClave & Jafri, 2007). In our study, 11 (30.6%) patients had new PEG tubes placed after treatment with external traction during the same session. This low incidence may be related to abscess or leakage from the PEG entrance.

In this retrospective study, we have shown that BBS can develop in the early period. Because it is believed that BBS occurs as a result of excessive tension between the internal and external bumpers, education of patients' relatives and caregivers is also very important. It is important to inform these people about PEG-related complications as well as proper care. Information about BBS-related symptoms such as inability to feed, purulent discharge from the PEG entrance, and inability to move the catheter should be told to patients' relatives and caregivers. Thus, early complications may be prevented by early diagnosis and appropriate treatment.

### Limitations

Important limitations of this study are that it was from a single center with a retrospective design. Another limitation of our study is that a substantial number of patients had PEG insertion in other centers. Thus, we could not accurately assess factors related to BBS and the exact frequency of BBS in our institution. However, we think that our study has important data about management and outcome of patients with BBS, for which there is no standard therapeutic approach.

### Conclusion

This study shows that BBS may occur in a short time after PEG placement and can cause mortality. In most patients,

the buried tube can be removed safely by external traction. Proper fixation, daily 180°–360° rotation of the PEG tube, and proper daily care may prevent BBS. We think that the education of patients and caregivers and regular follow-up may play a critical role in minimizing its incidence. Education and regular follow-up of patients and caregivers also allows early diagnosis. ✱

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