Gastrostomy Button for Paediatric Surgical Patients

Ravit Ruangtrakool, M.D.*
Mongkol Laohapensang, M.D.*
Akkrapol Mungnirandr, M.D.*
Chana Sathornkich, M.D.*
Polpatt Talalak, M.D.*

Introduction

The gastrostomy button, a skin-level non-refluxing feeding device, was introduced by Gauderer in 1984[1]. The gastrostomy button has many advantages over conventional gastrostomy. It offers a less obtrusive procedure, aesthetical superiority to permanent tube devices, and quality of life improvement. It decreases the incidence of dislodgement and avoids problems related to gastrostomy tubes such as stoma irritation, leakage, discomfort, granulation tissue and internal migration as well as eliminating the need for frequent tube changes and hospital visits[1-6]

Gastrostomy Button Insertion Into a Matured Stoma vs. Primary Gastrostomy Button

Traditionally, the gastrostomy button insertion requires a firm attachment between the stomach and anterior abdominal walls, and this means that the patients who need the gastrostomy procedure have to wait for at least 3 months before the gastrostomy button can be inserted safely.[1-4,7] This practice encounters problems directly related to the gastrostomy procedure itself, as well as several problems commonly seen with gastrostomy tubes, i.e., internal and external migration, inadvertent removal, pivoting action leading to leakage, tissue reaction and discomfort. Moreover, the patients require many hospital visits to dilate and calibrate the diameter of the gastrocutaneous tract before the gastrostomy button can be inserted and there is a risk of gastric separation and peritonitis associated with the interval before gastrostomy button insertion. Even if the recommendation of the interval time for the adhesion between the stomach and anterior abdominal walls was at least 3 months, or longer if

*Division of Paediatric Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

the patient was malnourished or on steroids, separation still occurred in 4 of 643 insertions[7]. Therefore, primary gastrostomy button is desirable because it can eliminate all these problems[8,9] including the complication of gastric separation and peritonitis[8].

Gastrostomy Button Insertion Procedures

1. Open procedure

Open procedure, whether combined with fundoplication or not, was the modified Stamm's technique similar to conventional gastrostomy. After the midline or transverse incisions were done, the gastrotomy was performed at the centre of two purse-string sutures. The gastrostomy button was applied by the introducer and inserted through the gastrotomy incision. When successful insertion was accomplished, the purse-string sutures were tied to snug the gastrostomy button. After another stab incision was performed suitable for the size of the gastrostomy button, the flange side of the button was brought through this wound and the seromuscular layer of the stomach was secured to the anterior abdominal walls by interrupted sutures.

2. Primary percutaneous gastrostomy button insertion

Preliminary reports of primary percutaneous gastrostomy button in adults and children have appeared recently[9,-13]. Previous attempts at primary button insertion have been limited by the difficulty in bringing the gastrostomy button's flanges through the abdominal walls. This problem was alleviated by either the use of the balloon gastrostomy button which could be easily inserted through the abdominal incision[13] or the development of the peel-away plastic shroud. In this technique, the feeding gastrostomy button enclosed the peel-away plastic shroud which had a rip cord following the line to open the shroud and release the button[8-11]. The modifications from the standard percutaneous endoscopic gastrostomy (PEG) were adapted from either "push" or "pull" techniques. The push techniques were developed by using either an "One-Step Button"[10-12] or a "Medicina Button"[13] whereas the "Surgitek One-Step Gastrostomy Tube"[9] was adapted from the standard "pull" PEG. The disadvantages of the gastrostomy button insertion methods modified from PEG were the development of a gastro-colonic fistula[11] and colocutaneous fistula[9] which were presumed to have occurred at the time of the initial placement.

3. Laparoscopic gastrostomy button insertion

3.1. Laparoscopic assisted gastrostomy button insertion[14]. This technique used the laparoscopic instruments delivering the stomach into the small wound and the modification of Stamm's gastrostomy was applied outside the abdominal cavity. After fundal wrap of fundoplication was completed, the gastrosplenic ligament was released with diathermy and the junction between the fundus and body of the stomach was mobilised. The skin incision was done inferiorly to the left side port and located between the costal margin and umbilicus. After the stomach was grasped by the artery forceps under direct vision, the pneumoperitoneum was released and the stomach was drawn into the wound. The 2 purse-string 4/0 polyglycolic sutures were performed and the button was inserted, then the stomach was fixed to the wound.

3.2. Laparoscopy-guided percutaneous gastrostomy button[15]. After the stomach was grasped by laparoscopic instruments, the 2 purse-string sutures were performed under laparoscopic control. The stomach was fixed to the abdominal walls by two through and through 2/0 polyglycolic sutures which penetrated skin, anterior abdominal walls, and the seromuscular layer of the stomach. The stomach was punctured by a needle and the Seldinger technique was applied. After the guide wire was inserted through the needle, the dilators were used and the Mic-key button was inserted percutaneously. The through and through stabilising sutures which maintained the stomach adhering to the abdominal walls, were left for 2 weeks when the integrity of the gastrocutaneous tract was sustained safely.

Types of the gastrostomy button

Many types of low-profile gastrostomy button have been improved technically over the past 10 years. The gastrostomy button was classified into two groups depending on the type of internal stabiliser. The first group, which had an enlarged tip (mushroom or Malecot style), had to be obturated or stretched with a special introducer whereas the second group had a balloon tip that served as an internal stabiliser. The prototype of the mushroom-type gastrostomy button was the Bard button (Bard Interventional Products, Tewksbury, MA) (Figure 1) whereas the prototype of balloon-type gastrostomy button was the Mic-key button (Medical Innovations Corporation, Draper, Utah, USA) (Figure 2).

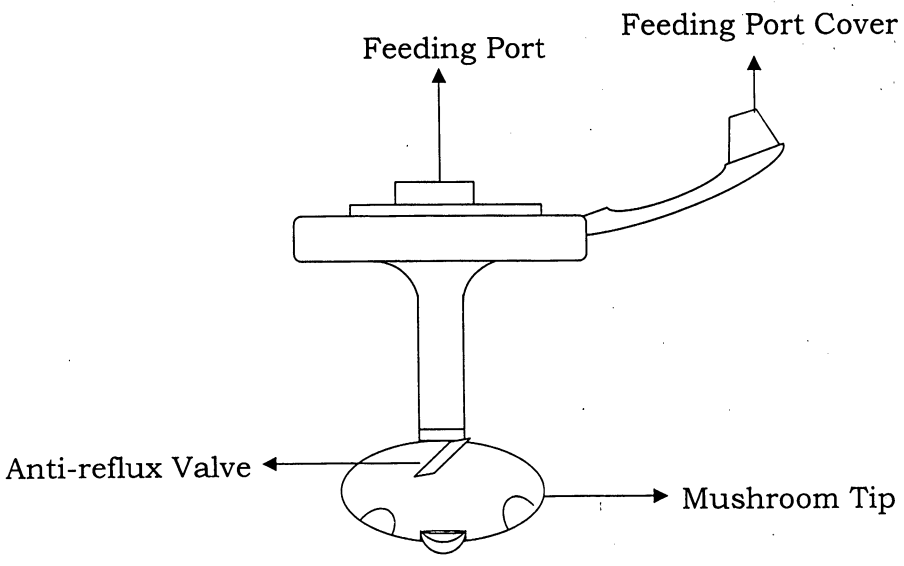

Figure 1. Bard button

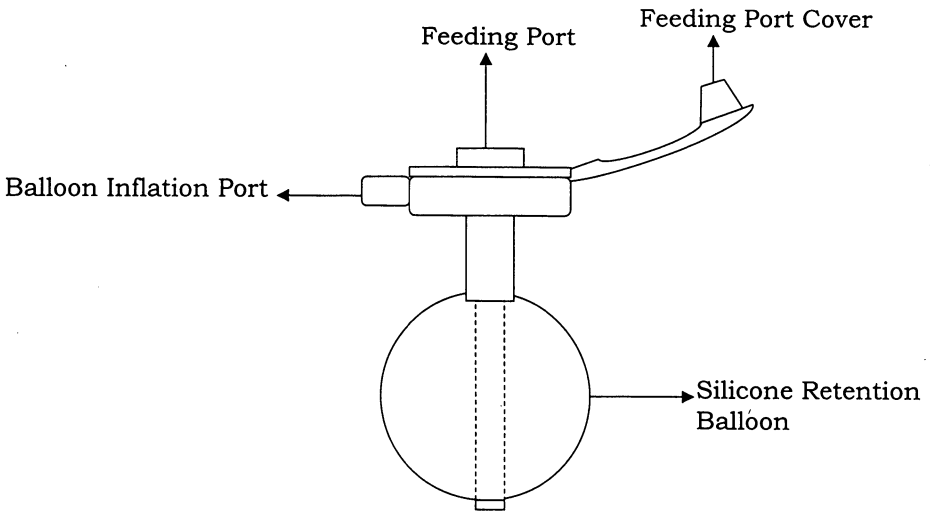

Figure 2. Mic-key button

These two types of gastrostomy buttons had advantages as well as disadvantages. Although the Bard button had a longer survival period, it had the disadvantage of pain during insertion and removal because the mushroom dome of the button did not allow it to collapse sufficiently to go into the stoma without pain. Valve incompetence was recognised when the stomach contents leaked through the lumen of the button. This problem was the most common cause of removal of the Bard button (74.2% in Gauderer's series[3]). Although the Mic-key button had the advantage of easy insertion, the major limitation was balloon rupture (leakage) which was the main cause of removal.

Because each product had its own advantages and disadvantages, the most suitable gastrostomy button for each patient had to be individually chosen and selected properly.

The longevity of the gastrostomy button

In 1988, Gauderer reported that the average longevity of the button was 8.9 months[3] but in a later study[4], he suggested that the average longevity was approximately 1 year.

Complications

1. Perforation of the gastrocutaneous tract following the gastrostomy button replacement

Two reports described three fatal cases of blind replacements relating to excessive long gastrocutaneous fistula tracts[16,17]. In these two cases, the tips of the buttons opened into the peritoneal cavity, while the other penetrated the liver parenchyma, leading to air embolism when flushed. Some authors recommended verifying the placement of every button device endoscopically or fluoroscopically[2,6,16-18]. In the largest reported series, Gauderer reported only 3 gastric separations from anterior abdominal walls in 545 button insertions[4] although the majority of the patients had not been examined endoscopically or fluoroscopically following the button replacements. Most series still recommended

changing the button device as a simple office procedure performed blindly without the need of endoscopic or fluoroscopic guidance[3,7,19].

2. Valve incompetence

Valve incompetence was the most common cause of removal of the Bard button. Valve incompetence occurred due to material fatigue, shaft deformability and encrustation of the tubing[2,3,20]. The problem of valve incompetence could be solved easily by inserting the button decompression tube into the shaft of the button to try to push the valve into the closed position. Flushing the device after use could reduce the incidence of valve incompetence.

3. The leakage of the stomach contents around the shaft of the button

The leakage of the stomach contents around the shaft was the second most common problem. Initially, the amount of the stomach residues was examined. Too much stomach residue caused the leakage of the contents around the button. For the Mic-key button, once an excess residue problem was excluded, the volume of the balloon inside the stomach was checked. If the appropriate volume of water was still in the balloon, an increase in the volume by 2 ml at a time, up to 10 ml, would stop this leakage. In the case of the Bard button, leakage might have occurred because the button was too small. In this situation, this Bard button had to be replaced.

4. Balloon rupture or balloon leakage

This was the most common cause of the Mic-key button's removal. Routine checking of the balloon once a week was recommended. The balloon should not be inflated with air because air rapidly migrates out of the balloon. The lifespan of the balloon varied according to several factors, i.e., volume of water used to inflate the balloon, gastric pH and tube care. Haas-Beckert[20] observed the leakage of the Mic-key balloon and found that the leakage site was from the inflation valve rather than the balloon itself.

5. Gastrooeophageal reflux

The open gastrostomy, PEG, as well as the gastrostomy button, have all been shown to increase the clinical and radiological gastrooesophageal reflux[21-24]. Clinical evaluation of gastrooesophageal reflux should be made before the procedure is carried out. The clinical judgement on whether the concomitant fundoplication should be performed or not, is still a matter of debate. Isch et al. suggested that the concomitant fundoplication should be omitted if clinical reflux had not been demonstrated, even though radiological gastrooesophageal reflux was still present[21].

6. Pressure ulcer under the external stabiliser

A shaft that was too short caused a pressure ulcer under the external stabiliser as well as the embedding of the internal stabiliser in the gastric mucosa. To avoid these complications, the shaft should be sized a little longer than the tract, allowing the external stabiliser to stick out a few millimetres[25]. Rotation of the button daily was recommended.

7. Button blockage

Blockage could be prevented by flushing the button with 10 to 20 ml warm water before and after each feeding and medication, or every 3 to 4 hours if the patient was receiving continuous feeding. Medication could block the button and should be in liquid form when possible.

8. Migration

Internal and external migrations of gastrostomy buttons have been described but the incidences were rare[26,27]. External migration of the buttons was thought to occur in the small diameter button which had inadequate diameter of the dome to butt against the luminal surface of the stomach[10] Excessive traction and too tight a fit of the button should be avoided[9,10].

REFERENCES :

1. Gauderer MWL, Picha GJ, Izant RJ Jr. The gastrostomy "button": a simple, skin level non-refluxing device for long- term enteral feeding. J Pediatr Surg 1984; **19**: 803-5.
2. Foutch PG, Talbert GA, Gaines JA, et al. The gastrostomy button: a prospective assessment of safety, success, and spectrum of use. Gastrointest Endosc 1989; **35**: 41-4.
3. Gauderer MWL, Olsen MM, Stellato TA, Dokler ML. Feeding gastrostomy button: experience and recommendations. J Pediatr Surg 1988; **23**: 24-8.
4. Gauderer MWL. Gastrostomy techniques and devices. Surg Clin North Am 1992; **72**: 1285-98.
5. Malki TA, Langer JC, et al. A prospective evaluation of the button gastrostomy in children. Can J Surg 1991; **34**: 247-50.
6. Shike M, Wallach C, Gerdes H, Hermann-Zaidius M. Skin level gastrostomies and jejunostomies for long-term enteral feeding. J Parenter Enteral Nutr 1989; **13**: 648-50.
7. Gauderer MWL, Stellato TA, Wade DC. Complications related to gastrostomy button replacement. Gastrointest Endosc 1993; **39**: 467.
8. Stylianos S, Flanigan LM. Primary button gastrostomy: a simplified percutaneous, open, laparoscopy-guided technique. J Pediatr Surg 1995; **30**: 219-20.
9. Marion MT, Zweng TN, Strodel WE. One-stage gastrostomy button: an assessment. Endosc 1994; **26**: 666-70.
10. Treem WR, Etienne NL, Hymans JS. Percutaneous endoscopic placement of the "button" gastrostomy tube as the initial procedure in infants and children. J Pediatr Gastroenterol Nutr 1993; **17**: 382-6.
11. Ferguson DR, Harig JM, Kozarek RA, et al. Placement of a feeding button (One-Step Button) as the initial procedure. Am J Gastroenterol 1993; **88**: 501-4.
12. Kozarek RA, Payne M, Barkin J, et al. Prospective multicenter evaluation of an initially placed button gastrostomy. Gastrointest Endosc 1995; **41**: 105-8.
13. Griffiths M. Single-stage percutaneous gastrostomy button insertion: a leap forward. J Parent Enter Nutr 1995; **20**: 237-9.
14. Andersson L, Mikaelsson C, Arnbjornsson E, Larsson LT. Laparoscopy aided gastrostomy in children. Annales Chirurgiae et Gynaecologiae 1997; **86**: 19-22.
15. Stylianos S, Flanigan LM. Laparoscopy-guided button gastrostomy in children after previous abdominal surgery. J Laparoendosc Surg 1995; **5**: 199-201.
16. McQuaid KR, Little TE. Two fatal complications related to gastrostomy "button" placement. Gastrointest Endosc 1992; **38**: 601-3.
17. Moses PL, Morse RA, Smith RE. A fatal complication related to gastrostomy button replacement. Am J Gastroenterol 1995; **90**: 1342-3.
18. Borge MA, Vesely TM, Picus D. Gastrostomy button placement through percutaneous gastrostomy tracts created with fluoroscopic guidance: experience in 27 children. JVIR 1995; **6**: 179-83.
19. Gauderer ML, Stellato TA. Gastrostomy button: why complicate an office procedure? Gastrointest Endosc 1989; **35**: 468-9.
20. Haas-Beckert B, Heyman M.B. Comparison of two skin-level gastrostomy feeding tubes for infants and children. Pediatr Nurs 1993; **19**: 351-64.
21. Isch JA, Rescorla FR, Scherer III LRT, et al. The development of gastroesophageal reflux after percu-

taneous endoscopic gastrostomy. J Pediatr Surg 1997; **32**: 321-3.

22. Papaila JG, Vane DW, Colville C, et al. The effect of various types of gastrostomy on the lower esophageal sphincter. J Pediatr Surg 1987; **22**: 1198-202.
23. Grunow JE, Al-Hafidh AS, Tunell WP. Gastroesophageal reflux following percutaneous endoscopic gastrostomy in children. J Pediatr Surg 1989; **24**: 42-5.
24. Seekri IK, Rescola FJ, Canal DF, et al. Lesser curvature gastrostomy reduces the incidence of postoperative gastroesophageal reflux. J Pediatr Surg 1991; **26**: 982-5.
25. Faller N, Lawrence KG. Comparing low-profile gastrostomy tubes. Nursing 1993; **23**: 46-8.
26. Berman JH, Radhakrishnan J, Kraut JR. Button gastrostomy obstructing the ileocecal valve removed by colonoscopic retrieval. J Pediatr Gastroenterol Nutr 1991; **13**: 426-8.
27. Brown DN, Barthel JS. External PEG button migration. Gastrointest Endosc 1995; **42**: 280.