

Comparison Between Mushroom-Type and Balloon-Type Gastrostomy Buttons

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Abstract

The gastrostomy button has been improved rapidly over the last ten years. The gastrostomy button was divided into two groups. The first group had a mushroom tip and, in this study, the Bard button represented this group. The other had a balloon as an internal stabiliser and the Mic-key button represented this group. The authors retrospectively studied all buttons inserted at the Royal Children's Hospital, Brisbane between 1988 and 1995. The average longevity of Bard and Mic-key buttons were 378.82 and 259.62 days respectively. Valve incompetence was the most common cause of removal of the Bard button (38%), whereas, balloon rupture was the major cause of removal of Mic-key button (44%). Each type of gastrostomy button had its own advantages and disadvantages and these special characteristics will be discussed.

Key word : Adult, Child, Stomach, Enteral Nutrition/Instrumentation, Enteral Nutrition/Adverse Effects, Follow-up Studies, Gastrostomy, Human, Silicone Elastomers, Intubation, Gastrointestinal

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After the gastrostomy button, a skin-level non-refluxing feeding device, was introduced by Gauderer in 1984⁽¹⁾, many types of low-profile gastrostomy buttons have been improved technically over the last 10 years. The gastrostomy button was classified into two groups depending on the

types of internal stabiliser. The first group that 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 internal stabiliser. Each product had its own advantages and disadvantages. In this

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article, we examine the special characteristics of these two types of gastrostomy button as well as their advantages and disadvantages.

In order to compare the different clinical outcomes between the two types of gastrostomy buttons, we retrospectively studied all buttons for the types of buttons, indications, longevity of the buttons and causes of the button removal.

MATERIAL AND METHOD

Because an adequate follow-up time was required, we retrospectively studied all buttons of new patients who had a button inserted in the Royal Children's Hospital, Brisbane, Australia between December 1988 and December 1995. One hundred and thirty-two patients (M = 60, F = 72) and 388 buttons were included. Among these gastrostomy buttons, 256 mushroom-type gastrostomy buttons (Bard buttons- Bard Interventional Products, Tewksbury, MA) and 49 balloon-type gastrostomy buttons (Mic-Key buttons- Medical Innovations Corporation, Draper, Utah, USA) were recorded. With regard to the longevity of gastrostomy buttons in this study, we excluded 106 buttons that were either still in place during the last follow-up or the patients had died during the time they had the last buttons. The data were collected up to November 1997. The follow-up data were collected from medical records and questionnaires by telephone. The average follow-up time was 3.07 years.

The data measured the equality of variance by F test and the analysis of the difference between each group was performed by Student's *t* test for

the unmatched group. The statistic significance was p value < 0.05 .

RESULTS

One hundred and thirty-two patients had 388 gastrostomy buttons inserted. The indications of insertion were 69 intellectual handicap, 29 cystic fibrosis, 7 bronchopulmonary dysplasia, 5 chromosomal abnormalities and 22 miscellaneous causes comprising 4 severe gastrooesophageal reflux, 3 oesophageal atresia with stricture and dysmotility, 3 metabolic disorders, 2 Mobius syndrome, 2 giant tumours at the neck and chest wall and one each for caustic oesophageal and stomach injury, Foetal Akinesia syndrome, attention deficit disorder, laryngotracheomalasia, neuronal intestinal dysplasia, Opitz Frias syndrome, surfactant deficiency syndrome and one unrecognised syndrome.

Thirty-three patients received gastrostomy buttons without matured gastrostomy stoma as primary gastrostomy buttons (19 with open fundoplication, 3 with laparoscopic fundoplication and 11 without fundoplication). Ninety nine patients received gastrostomy buttons after matured gastrostomy stoma. In this group, 56, 28, 12 and 3 cases received gastrostomy buttons following percutaneous endoscopic gastrostomy, open fundoplication with gastrostomy, open gastrostomy, and laparoscopic fundoplication with gastrostomy respectively.

The average longevity \pm standard deviation of all buttons ($n = 282$) which were taken out and their longevity was recorded, was $360.43 \pm$

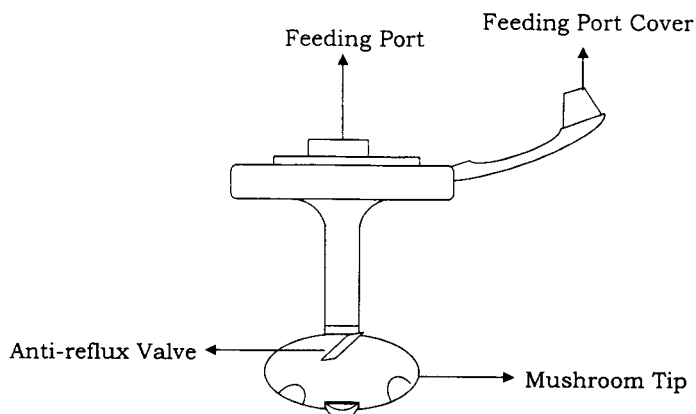


Fig. 1. Bard button.

Table 1. The causes of button removal.

Causes of button removal	Bard (n = 135)	Mic-key (n = 25)	All (n = 201)
1. Valve incompetence	37.78%(51)	4.00% (1)	32.84%(66)
2. Leak around button	19.26%(26)	12.00% (3)	19.40%(39)
3. Device damage	17.04%(23)	8.00% (2)	13.93%(28)
4. Too short	9.63%(13)	0.00% (0)	6.97%(14)
5. Balloon rupture	0.00% (0)	44.00%(11)	5.47%(11)
6. Severe granulation	2.96% (4)	12.00% (3)	4.98%(10)
7. Infection	3.70% (5)	4.00% (1)	2.99% (6)
8. Miscellaneous	9.63%(13)	16.00% (4)	13.43%(27)
Accidental pulled out	3	2	10
Severe GOR	2	1	4
Internal migration	1	1	3
Too long	1	0	3
Blockage	2	0	2
Stoma pain	1	0	1
Hematemesis	1	0	1
Gastric separation	1	0	1
External migration	1	0	1
Poor stoma location	0	0	1

- 310.24 days. Although the usages of 256 Bard and 49 Mic-key gastrostomy buttons were recorded, the longevity of the gastrostomy buttons could be calculated for only 187 Bard and 34 Mic-key buttons. The average longevity \pm standard deviation of Bard and Mic-key buttons were 378.82 \pm 305.32 days and 259.62 \pm 247.70 days respectively. The average longevity of Bard button was statistically longer than Mic-key button and $p = 0.0326$.

Two hundred and eighty two gastrostomy buttons were taken out. Sixteen gastrostomy buttons were removed because they were no longer need. Among 266 removed gastrostomy buttons, the causes of removal were recorded in 201 gastrostomy buttons. The causes of button removal were recorded in 135 Bard buttons and 25 Mic-key buttons respectively. The causes of button removal are revealed in Table 1.

In this series, 12, 3 and 1 patients died from respiratory failure, end stage of neurodegenerative disorder and cardiac failure from an underlying congenital heart anomaly respectively. No mortality was directly derived from the operative procedure.

DISCUSSION

The gastrostomy button, a non-refluxing skin level device, had many advantages over the gastrostomy tube. It offered a less obtrusive pro-

cedure, aesthetical superiority to permanent tube devices and quality of life improvement. It decreased the incidence of dislodgment and avoided 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⁾.

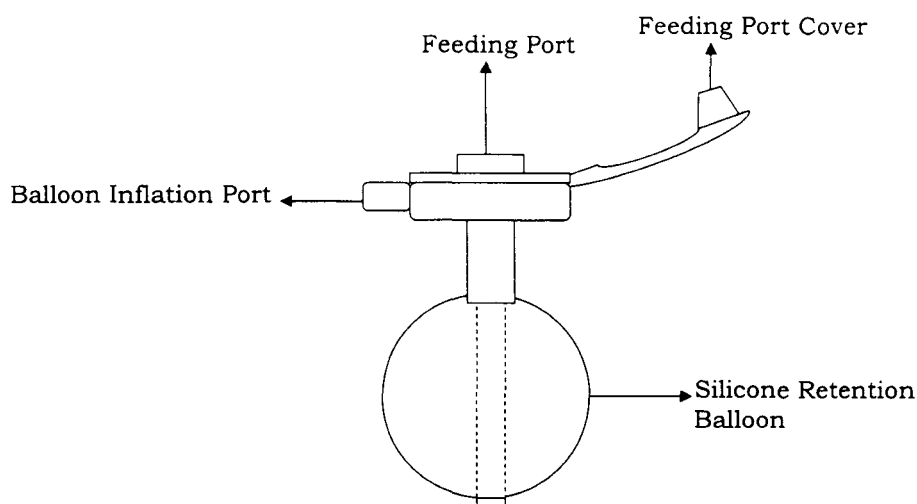
In 1988, Gauderer reported that the average longevity of the button was 8.9 months⁽³⁾ but in a later study⁽⁴⁾, he suggested that the average longevity was approximately 1 year. In our series, the average longevity of all buttons was 360.43 days. The prototype of the mushroom-type gastrostomy button in our series was the Bard button, whereas, the prototype of the balloon-type gastrostomy button was the Mic-key button. The Bard button (n=256) which was the most frequently used button in this series, lasted longer than the Mic-Key button (n=49), (378.82 days and 259.62 days respectively) with statistic significance.

These two types of gastrostomy buttons had their own advantages as well as disadvantages. The comparison between Bard and Mic-key buttons is revealed in Table 2.

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

Table 2. Comparison between Bard and Mic-key gastrostomy buttons.

	Bard	Mic-key
Internal stabiliser	Mushroom dome	Inflatable balloon
External stabiliser	Rectangular	Round
Obturator tube requirement	Yes	No
Shaft diameters	#18, #24, #28 French	# 14, #18, #24 French
Anti-reflux valve	Trap-door anti-reflux valve at the internal end of the shaft	Heimlich anti-reflux valve at the external end of the shaft
Connecting device	Different connecting devices required for each shaft diameter	One connecting device required for all shaft diameters
Advantages	Longer longevity	1. Easy insertion 2. Low incidence of valve incompetence
Disadvantages	1. Pain during insertion and removal 2. High incidence of valve incompetence	Shorter longevity
Causes of removal	1. Valve incompetence 2. Leakage around button	1. Balloon rupture or leakage 2. Leakage around button

**Fig. 2. Mic-key button.**

sufficiently to go to the stoma without pain. Valve incompetence was recognised when the stomach content leaked through the lumen of the button. This problem was the most common cause of removal of the Bard button (37.78%). Valve incompetence occurred due to material fatigue, shaft deformability and encrustation of the tubing^(2,3,7). The problem

of valve incompetence could be solved by insertion of the button decompression tube into the shaft of the button trying to push the valve into the closed position.

Although Mic-Key had an advantage of easy insertion, the major limitation was balloon rupture or balloon leakage which was the main

cause of removal (44%). Routine checking of the balloon once a week was recommended. The balloon should not be inflated with air because air would rapidly migrate out of the balloon. The life span 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⁽⁷⁾ observed leakage of the Mic-Key and found that the leakage site was from the valve for the balloon inflation instead of the balloon itself.

The leakage of the stomach content around the shaft of the button was the second most common problem (19.4%). Initially, the amount of stomach residual should be examined. Too much stomach residual caused the leakage of the content around the button. For the Mic-key button, after the too much residual problem was excluded, the balloon inside the stomach was checked for its volume. If the appropriate volume of water was still in the balloon, increase of 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 occur

because the button was too small. In this situation, this Bard button had to be replaced.

A shaft that was too short, caused a pressure ulcer under the external stabiliser as well as embedment in the gastric mucosa of the internal stabiliser. 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⁽⁸⁾. Daily rotation of the button was recommended.

Blockage of the button could be prevented by flushing the button with 10 to 20 ml of 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.

Because each product had its own advantages and disadvantages, the most suitable gastrostomy button for the patient had to be selected properly. The most suitable gastrostomy button was individually chosen and should be judged from this basic knowledge.

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การศึกษาเปรียบเทียบระหว่างกระดุมกระเพาะอาหารชนิดปลายเป็นรูปดอกเห็ดกับชนิดปลายเป็นลูกโป่ง

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Gastrostomy button ได้รับการพัฒนาอย่างรวดเร็วในรอบสิบปีที่ผ่านมา เราสามารถจำแนก Gastrostomy button ได้เป็น 2 ชนิด, ชนิดที่หนึ่งมีปลายเป็นรูปเห็ด และ Bard button ก็เป็นตัวแทนในกลุ่มนี้ อีกชนิดมีลูกโป่งเป็นตัวยึดภายใน และ Mic-key button ก็เป็นตัวแทนในกลุ่มหลัง ผู้เขียนได้ทำการศึกษาย้อนหลังของ Button ที่ได้รับการผ่าตัดใส่ ณ โรงพยาบาล Royal Children's Hospital กรุง Brisbane ระหว่างปี พ.ศ. 2531 ถึงปี พ.ศ. 2538 ค่าเฉลี่ยอายุการใช้งานของ Bard button และ Mic-key button มีค่าเท่ากับ 378.82 วัน และ 259.62 วัน ตามลำดับ การรั่วของลิ้นของ button เป็นสาเหตุที่สำคัญที่สุดในการเอา Bard button ออก และพบได้ 38% ในขณะที่การแตกรั่วของลูกโป่งก็เป็นต้นเหตุสำคัญในการเอา Mic-key button ออกและพบได้ 44% Gastrostomy button แต่ละชนิดมีข้อดีและข้อเสียแตกต่างกัน และลักษณะพิเศษเหล่านี้จะได้รับการพิจารณาแจกแจงในบทความนี้ต่อไป

คำสำคัญ : เด็ก, ทารก, ผู้ใหญ่, กระเพาะอาหาร, การให้อาหาร, การให้สารอาหาร, โภชนาการ, อุปกรณ์ให้สารอาหาร, เครื่องมือให้สารอาหาร, ผลแทรกซ้อน, การติดตามผล, ท่ออาหาร, กาสตรอสโตมี, ซิลิโคน, ลำไส้, มนุษย์

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