Postoperative gastrostomy site leakage correlated to the dimension of the gastrostomy button in children

Helen Sjövie, Lars Torsten Larsson, Einar Arnbjörnsson
Department of Pediatric Surgery, Skåne University Hospital, Lund, Sweden

Abstract

The laparoscopic placement of gastrostomy buttons for feeding tubes is the preferred method of gastrostomy in children with feeding requirements. This intervention often leads to some minor postoperative problems, including gastrostomy site leakage. The aim of our study was to test the hypothesis that the postoperative leakage after a video-assisted gastrostomy is correlated to the dimension of the gastrostomy button used during the operation. Included in the study were 164 children with nutritional problems who consecutively underwent surgery; they had a video-assisted gastrostomy operation. In the first 87 children, a 14 French (Fr) gastrostomy button was used and in the last 77, a 12 Fr button was used. After the operation, the children were followed up prospectively and all complications were documented according to the study protocol.

Our study revealed a significant correlation between the dimension of the gastrostomy button and the postoperative leakage at the gastrostomy site. The rate of leakage at the gastrostomy site was 37% in the children who had 14 Fr gastrostomy buttons compared to 18% (P=0.038) in the children who had 12 Fr gastrostomy buttons, during the first six months postoperatively. These results suggest that postoperative gastrostomy site leakage was significantly higher in children who had 14 Fr gastrostomy buttons than in those with 12 Fr buttons. To avoid this complication, 12 Fr gastrostomy buttons should be used.

Introduction

Primary laparoscopic placement of gastrostomy buttons for feeding tubes is a safe and simple technique and the preferred method of gastrostomy in children.1 The dimensions of the gastrostomy buttons used have decreased over time from 24 French (Fr) to 12 Fr. The question arose whether the reduction in dimension of the gastrostomy button leads to fewer postoperative complications and if we should demand even smaller devices (e.g. 8 Fr) from the industry. This study was undertaken to test the hypothesis that a reduction of the dimensions of the gastrostomy buttons leads to fewer postoperative complications. We are not aware of any similar reports in the literature.

Materials and Methods

A heterogeneous sample of 164 children, who consecutively had the standardized laparoscopic placement of a gastrostomy button1,2 under general anesthesia during the period from January 2005 to August 2009, were included prospectively and followed up. The first 87 patients received a 14 Fr gastrostomy button in the stoma while the remaining 77 received 12 Fr gastrostomy buttons in their stoma. The length of the buttons used was 1.2 cm or less in 47% of the children and 1.5 cm or more in 53% of the children, with no significant difference between the groups. We used the MicKey® gastrostomy button (Ballard Medical Product, UT, USA). Twelve Fr (1 Fr = 1/3 mm) buttons have the diameter of 4.0 mm compared with 4.7 mm of the 14 Fr buttons, making the cross-sectional area (π × r^2) of the 12 Fr button 72% of that of the 14 Fr button.

The indications for a gastrostomy were nutritional problems that persisted for more than six months,3 in children with severe diseases. There were no contraindications to surgery in any of the cases. A barium meal had been performed in all patients to rule out a gastric outlet obstruction. All patients were evaluated clinically for gastro-esophageal reflux disease (GERD) before the operation and none had the indication for concomitant surgery for GERD.

All the children were followed-up prospectively during the first postoperative days in the hospital and at one and six months after the operation. The endpoint of the study was six months after the surgery. Additional follow-ups were performed any time at the request of the child’s guardians. All complications were documented according to a standardized protocol by a specially trained nurse. The postoperative complications requiring treatment that we registered included:

- granuloma resulting in intervention, such as catherizations;
- infection requiring antibiotics; and
- a leakage that required further management, including a change to a new button with a different length or size, or a change of volume in the balloon of the button, or frequent (greater than two times a day) change of dressings.

This study included follow-up of only the patients operated on routinely. The protocol was designed to meet the legislative requirements. This work was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

Statistical considerations

Based on our previously published data using the frequency of postoperative complications as the primary endpoint, a sample size of 75 patients and 75 controls was calculated as sufficient to perform a t-test, obtaining a significant difference when the mean difference is 0.3. The alpha level for rejecting the null hypothesis of mean difference equal to zero is 5% and the power is above 80%. The Mann-Whitney two-tailed U-test was used. All statistical computations were made using SPSS version 15 (SPSS, Inc., Chicago, IL, USA). A value of P<0.05 was considered significant.

Results

There were no serious surgical complications, such as perforation of hollow organs or bleeding. In the immediate postoperative period, no wound or intra-abdominal complications occurred. There were no re-operations owing to adhesions or leakage. The patients’ demo-
gastrostomy channel with increased abdom-
trostomy and leading to a tightening of the
abdominal wall, thereby lengthening the gas-
tomy button; or the path of the gastrostomy
button closing more tightly around the gastros-
tomy of the same type as we
use of a gastrostomy button with smaller dimen-
sions reduces the number of postoperative
gastrostomy site leakages. However, both the
12 Fr and 14 Fr buttons are very small and a
greater leakage rate may be seen if we com-
pare them with buttons of larger dimensions;
for example, 24 Fr buttons with an area four
times that of the 12 Fr buttons. Data from our
previous publications where gastrostomy but-
tons with larger dimensions were used showed
that large gastrostomy buttons were associated
with more postoperative complications.3,4,6 When using 24 Fr and 16 Fr
gastrostomy buttons of the same type as we
did not affect the lives of the infants and their
families. However, they should be taken into
account in patient counseling and when dis-
cussing the need for a gastrostomy in individ-
uals. When correlating the incidence of minor
complications in these groups of infants and
children with different diagnoses and sizes of
gastrostomy buttons, we found a significant
difference between the gastrostomy site leak-
age and the size of the gastrostomy buttons. These findings support our hypothesis that the
size of the gastrostomy button influences the
complications of leakage through the gastro-
stomy site. Therefore, we can claim that the use
of a gastrostomy button with smaller dimen-
sions reduces the number of postoperative
gastrostomy site leakages. However, both the
12 Fr and 14 Fr buttons are very small and a


\begin{table}
\centering
\begin{tabular}{ |c|c|c|c| }
\hline
\textbf{Diagnoses} & \textbf{12 Fr} & \textbf{14 Fr} & \textbf{P*} \\
\hline
Cerebral palsy & 35 (46%) & 36 (42%) & \\
Malignancy & 3 (4%) & 7 (8%) & \\
Cardiac anomaly & 13 (17%) & 15 (17%) & \\
Metabolic disease & 8 (10%) & 14 (16%) & \\
Syndrome & 14 (18%) & 9 (10%) & \\
Gastrointestinal malformations & 4 (5%) & 6 (7%) & \\
\hline
\end{tabular}
\caption{Complications of a gastrostomy button, button dimension, and button length.}
\end{table}

Discussion
When correlating the incidence of minor
complications in these groups of infants and
children with different diagnoses and sizes of
gastrostomy buttons, we found a significant
difference between the gastrostomy site leak-
age and the size of the gastrostomy buttons. These findings support our hypothesis that the
size of the gastrostomy button influences the
complications of leakage through the gastro-
stomy site. Therefore, we can claim that the use
of a gastrostomy button with smaller dimen-
sions reduces the number of postoperative
gastrostomy site leakages. However, both the
12 Fr and 14 Fr buttons are very small and a
greater leakage rate may be seen if we com-
pare them with buttons of larger dimensions;
for example, 24 Fr buttons with an area four
times that of the 12 Fr buttons. Data from our
previous publications where gastrostomy but-
tons with larger dimensions were used showed
that large gastrostomy buttons were associated
with more postoperative complications.3,4,6 The complications from the gastrostomy button in
this study were recorded prospectively, and
included local infections and mechanical prob-
lems with pain and leakage. The same types of
complications were encountered in both
groups and were similar to those in our previ-
ous experience.3,4,6 When using 24 Fr and 16 Fr
gastrostomy buttons of the same type as we
used in this study, we demonstrated a higher
frequency of postoperative complications.3,4,6
It is unknown whether even smaller gastro-
stomy buttons (e.g. 8-10 Fr buttons) may
decrease the postoperative gastrostomy site
leakage further. In addition to the size of the
gastrostomy buttons, there are other ways to
decrease the leakage rate. For example, changes in the operative technique for con-
structing a gastrostomy may lead to a gastro-
stomy closing more tightly around the gastro-
stomy button; or the path of the gastrostomy
may be laid in an oblique way through the
abdominal wall, thereby lengthening the gas-
trostomy and leading to a tightening of the
gastrostomy channel with increased abdomi-


\begin{table}
\centering
\begin{tabular}{ |c|c|c|c| }
\hline
\textbf{Gastrostomy button dimension} & \textbf{12 Fr} & \textbf{14 Fr} & \textbf{P*} \\
\hline
\textbf{Age in years, median (range)} & 1.1 (1 mth-14 yr) & 1.7 (2 mth-14 yr) & 0.054 \\
\textbf{Mean ± SD} & 2.5 ±3.1 & 3.1 ±3.8 & \\
\textbf{Weight in kg, median (range)} & 9.0 (3.6-39.4) & 9.4 (4.0-41.0) & 0.212 \\
\textbf{Mean ± SD} & 10.4 ±6.4 & 11.9 ±7.8 & \\
\textbf{Z-score** median (range)} & 1.9 (–7.1 –1.9) & 2.1 (–6.0-1.3) & 0.195 \\
\textbf{Mean ± SD (range)} & –2.1 ±1.8 & –2.2 ±1.6 & \\
\hline
\end{tabular}
\caption{Demographic data and the diagnosis of the children.}
\end{table}

In the method described here as well as in
the open surgical procedure, the gastrostomy
button is put in place directly, eliminating the
need for a later change of the button, as is the
case after PEG where this is usually done after
six weeks and may demand anesthesia or
sedation for the child.
In spite of the fact that the data presented in
this study were gathered prospectively, there
are weaknesses and bias in the study. Firstly,
the operative interventions were performed by
seven pediatric surgeons, and therefore there
are small individual variations in the perform-
ance of the operative intervention. Secondly,
although the follow-up evaluation at one and
six months postoperatively was in the hands of
two professionals at the hospital, there is a
place for small individual variations in the
in the peritoneal cavity, peritonitis, dislodge-
ment or occlusion of the gastrostomy button,
were not seen in our patients. The problems
met by the infants and their parents and sum-
marized in this study are reported in the litera-
ture rarely, although they are well known and
often seen after a surgical gastrostomy or per-
cutaneous endoscopic gastrostomies (PEG).
These problems were not life threatening and
did not affect the lives of the infants and their
families. However, they should be taken into
account in patient counseling and when dis-
cussing the need for a gastrostomy in individ-
ual patients.
reporting of the registered complications. Thirdly, the patient group was heterogeneous with differences in diagnosis and age, and the number is relatively small. Fourthly, the important difference in the patients' state of nutrition was not taken into account in these small groups of children when the cohort had been split into subgroups. Nevertheless, we concluded that a reduction of postoperative gastrostomy site leakage may be gained with the use of gastrostomy buttons with a smaller dimension.

References