Journal of Pediatric Surgery (2013) **48**, 2506–2510

ELSEVIER

Journal of Pediatric Surgery

www.elsevier.com/locate/jpedsurg

Persistent gastrocutaneous fistula: Factors affecting the need for closure

Deidre L. Wyrick[a,*], Andrew P. Bozeman[a], Samuel D. Smith[a], Richard J. Jackson[a], R. Todd Maxson[a], Karen R. Kelley[a], Donna L. Mathews[a], Jingyun Li[b], Christopher J. Swearingen[b], Melvin S. Dassinger[a]

[a]*Department of Pediatric Surgery, University of Arkansas for Medical Sciences, Arkansas Children's Hospital, 1 Children's Way, Slot 837, Little Rock, AR, USA*
[b]*Pediatric Biostatistics, University of Arkansas for Medical Sciences, Arkansas Children's Hospital, Little Rock, AR, USA*

Received 20 March 2013; revised 31 May 2013; accepted 5 June 2013

Key words:
Gastrostomy tube;
Gastrocutaneous fistula;
Nissen fundoplication

Abstract

Purpose: The occurrence of gastrocutaneous fistula (GCF) is a well-known complication after gastrostomy tube placement. We explore multiple factors to ascertain their impact on the rate of persistent GCF formation.

Methods: We retrospectively reviewed patient records for all gastrostomies (GT) constructed at our institution from 2007 to 2011. Association of GCF with method of placement, concomitant fundoplication, neurologic findings, duration of therapy, and demographics was evaluated using logistic regression.

Results: Nine hundred fifty patients had GTs placed, of which 148 patients had GTs removed and 47 (32%) of 148 required surgical closure secondary to persistent GCF. Laparoscopic and open procedures comprised 79 (53%) of 148 and 69 (47%) of 148, respectively. Seventeen (22%) patients in the laparoscopic group developed persistent GCF, compared to 30 (43%) in the open group ($P = 0.035$, OR = 2.52). Seventy-one patients had concomitant Nissen fundoplication. Thirty-one (44%) developed GCF, compared to 16 (21%) without a Nissen ($P = 0.002$, OR = 4.94). Patients with button in place for 303 days had persistent GCF incidence of 23%, compared to 45% at 540 days ($P < 0.001$, OR = 3.51) and 50% at 850 days ($P = 0.011$, OR = 4.51). Patients with device placed at 1.8 months of age were more likely to develop GCF compared to those with device placed at 8.9 months of age ($P = 0.017$, OR = 2.35).

Conclusion: Open operations, concurrent Nissen and younger age at placement were all statistically significant factors causing persistent GCF.

Placement of a gastrostomy appliance is a commonly performed procedure that establishes long-term enteral access in children with a variety of conditions including dysphagia, aspiration and failure to thrive. The traditional method of placement is via open, Stamm technique; however, with the increasing sophistication of minimally invasive techniques, percutaneous, image-guided, and laparoscopic approaches

* Corresponding author. Tel.: +1 501 364 1446; fax: +1 501 364 1516.
E-mail address: dlwyrick@uams.edu (D.L. Wyrick).

0022-3468/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jpedsurg.2013.06.001

are frequently employed. Once access is no longer needed, the button or tube is simply removed. Unfortunately, up to 43% of children will have a persistent gastrocutaneous fistula (GCF) that requires closure [1,2]. Several studies [1–6] have evaluated factors that affect spontaneous closure of GCFs, but none have demonstrated that operative approach made a significant difference in closure rate. Our study was designed to determine if open gastrostomy and concomitant fundoplication were associated with a higher rate of persistent GCF.

1. Methods

After obtaining institutional review board approval (IRB 135777) for this study, a retrospective medical record review was completed to identify all patients who had gastrostomy (GT) appliances placed at Arkansas Children's Hospital from 2007 to 2011. These dates were chosen because the open and laparoscopic techniques were performed with similar frequency during this time. For those patients with persistent GCF, method of placement (laparoscopic vs. open), concomitant fundoplication, elapsed time of therapy, and demographics were evaluated. The five patients who underwent percutaneous gastrostomy were excluded.

When the gastrostomy appliance was no longer needed, it was removed and the fistulous tract was cauterized with silver nitrate. Temporizing measures were not used to aid with closure of the fistula tract. If the fistula was still present after 2 weeks the patients was reevaluated in the clinic and the patient was scheduled for operative closure. Average time to operative closure after being reevaluated in clinic was 102 days.

1.1. Operative technique

Open gastrostomies were performed in a typical Stamm fashion. The stomach was affixed to the anterior abdominal wall with permanent suture using this technique. Gastrostomy buttons were brought through the abdominal wall via a separate incision. Gastrostomy buttons were placed laparoscopically using one of two methods. The first method involved fixation of the stomach using monofilament suture tied around the button [7]. These sutures were removed on postoperative day 7. The second laparoscopic method involved fixation of the stomach using absorbable, braided suture which were tied extracoporeally in the subcutaneous tissue. Suture removal was not required when this method was used.

1.2. Statistical analysis

The primary outcome of this study was the presence or absence of a persistent GCF postgastrostomy. Unadjusted differences in demographic, method of placement, concomitant fundoplication, neurologic findings, and duration of therapy between the GCF outcomes were estimated using Mann–Whitney–Wilcoxon for continuous variables (age at G-Tube placement, duration of G-Tube placement), and chi-square test for categorical variables (gender, type of surgery, presence of neurologic disease). A logistic regression model was used to estimate the odds of requiring surgical closure secondary to GCF for each of the two surgical placement methods adjusting for key variables of interest: the elapsed time of G-Tube, patient's age at the time G-Tube placement, gender, need for Nissen fundoplication and presence of neurologic disease. Age and elapsed time were both modeled using restricted cubic splines, relaxing the strict linear relationship assumed in regression modeling while still maintaining the data as continuous [8]. After estimating the logistic regression model, both goodness-of-fit and overall model of discrimination were estimated. The *c*-statistic estimates how well the logistic regression model can discriminate between outcomes and is equivalent to the

Table 1 Summary of demographic and clinical features by gastrocutaneous fistulae occurrence.

	Incidence of gastrocutaneous fistulae		*P*
	No	Yes	
N	101	47	
Age at Placement (months)	3.94 (0.03, 147.29)	2.52 (0.03, 96.82)	0.027
Gender			0.760
Male	51 (51%)	25 (53%)	
Female	50 (49%)	22 (27%)	
Elapsed time of G-Tube placement (days)	491 (95, 1774)	646 (137, 1161)	0.085
Nissen fundoplication			0.003
No	61 (60%)	16 (34%)	
Yes	40 (40%)	31 (66%)	
Findings of neurologic disease			0.730
No	84 (83%)	38 (81%)	
Yes	17 (17%)	9 (19%)	
Surgery type			0.004 [a]
Lapraroscopic	62 (61%)	17 (36%)	
Open surgery	39 (39%)	30 (64%)	

[a] *N* (%) and chi-square test reported. Otherwise, median (minimum, maximum) and Mann–Whitney–Wilcoxon reported.