

# Persistence of a Gastrocutaneous Fistula after gastrostomy removal in children: Incidence and predictive factors

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## ABSTRACT

**Background/Purpose:** The aims of this study were to determine the incidence of persistent gastrocutaneous fistulas (GCF) after gastrostomy removal and to identify associated risk factors.

**Methods:** This retrospective study included 75 children from the *Centre Hospitalier Universitaire Vaudois*, Lausanne, Switzerland who had a gastrostomy performed between 1988 and 2010. The records of the children were reviewed for sex, age at the time of gastrostomy removal, underlying disease, type of gastrostomy placement and length of use, and then analyzed in order to find a correlation between the GCF and these parameters.

**Results:** The gastrostomy orifice did not close spontaneously within the first month in 33 of the patients (44%), and 15 subsequently underwent surgical closure. The mean duration of gastrostomy use was significantly longer in children who developed a persistent GCF (30 vs. 19 months,  $P = 0.03$ ). The other parameters studied did not show any significant association with the persistence of a GCF.

**Conclusions:** The only predictive factor determining the persistence of a GCF was found to be the timespan between the placement and removal of the gastrostomy appliance. Elective surgical closure of the gastrostomy orifice should be considered after 1 month of persistent GCF.

## BACKGROUND

There are two kinds of gastrostomies: gastrostomies with interposed digestive mucosa that have a minimal tendency to close spontaneously (f.ex. Witzel and Janeway procedures), and gastrostomies constructed by anchoring the outer gastric surface to the abdominal wall (f.ex. by Stamm technique, or Percutaneous Endoscopic Gastrostomy = PEG) [1], the latter being supposed to close spontaneously after removal of the feeding device.

Generally, after removal of the gastrostomy appliance, the orifice closes spontaneously in a matter of days, sometimes of hours [2]. The removal of the gastrostomy tube can be complicated by the persistence of a gastrocutaneous fistula (GCF) (figure 1). The aim of this study is to determine the incidence and to identify the predictive factors of this complication in a pediatric population.

## MATERIALS AND METHODS

We reviewed the surgical records of 301 patients of the department of pediatric surgery at the *Centre Hospitalier Universitaire Vaudois*, Lausanne, Switzerland, whose conditions required the creation of a gastrostomy between 1988 and 2010. Of these, 75 children were included in the study (mean age 6 years, range from 5 months to 17.5 years). The remaining 226 patients were dismissed for the following reasons: 49 still had their gastrostomy in place at the time of this study, 21 children had died with the gastrostomy still in place, 13 had their gastrostomy closed surgically at the time of another surgical procedure or within the first month after removal of the device, and 3 had had a Witzel gastrostomy; for the remaining 140 children, we lacked follow-up. The 75 patients included in this study had underlying conditions that were divided into three main groups: swallowing disorders (including neurological impairment, myopathy and cleft palate), inadequate nutriment intake (cystic fibrosis, cancer, chronic kidney disease, congenital error of metabolism, other genetic disorders requiring a higher calorie intake), and mechanical causes (caustic esophageal stenosis, abdominal adhesions, esophageal atresia) (figure 2). The other parameters taken into account were the sex of the child (male : female 1.3), the age at removal of the gastrostomy appliance, the technique used for gastrostomy placement (surgical open, surgical laparoscopic, and PEG) and the duration that the gastrostomy was left in place.

The patients were subdivided into two groups, the first including only children whose gastrostomy orifice closed spontaneously within 30 days after removal of the device, the second, including those whose

gastrostomy closed at a later moment as well as those requiring surgical closure of the orifice (i.e., those with a persistent GCF).

The persistence of a GCF was defined as a fistulous tract between the stomach and the skin evidenced by a leak that existed later than 30 days after removal of the gastrostomy appliance (tube or button) [3].

A Mann-Whitney test was used to compare means between two groups in regard to age at removal of the gastrostomy device and to duration the appliance was in place. To analyze association between sex and persistence of a GCF, we used a Fisher's test; chi-squared tests for independence were applied to examine the other clinical parameters.

## RESULTS

Of the 75 patients included in this study, 12 had an endoscopically and 45 a surgically placed (36 open, 9 laparoscopic) gastrostomy. In 42 children, the gastrostomy orifice closed spontaneously within 30 days. Of the remaining 33 patients, who developed a persistent GCF (44%), 15 needed surgical closure of the gastrostomy, while 18 closed belated, but spontaneously (figure 3). Before deciding surgical closure of a GCF, several (1 to 3) attempts of closure were made using  $\text{AgNO}_3$ .

Mean time to closure (spontaneous and surgical) from the removal of the gastrostomy appliance was 244 days (range 31 days to 7 years) in the group that developed a persistent GCF (group 2), versus 17 days (range 5 to 30 days) in the group with spontaneous closure (group 1). Mean time to spontaneous closure in group 2 was 53 days (range 31 to 114 days), after exclusion of patients who had their GCF surgically closed.

The mean duration of gastrostomy use in the patient population with a persistent GCF was significantly higher than in the group with no GCF (30 vs. 19 months,  $P = 0.03$ ).

There was no significant association ( $P > 0.05$ ) between either sex, underlying disease (swallowing disorders, inadequate nutriment intake, mechanical causes) or type of gastrostomy (surgical open, surgical laparoscopic, PEG) and the persistence of a GCF. Neither did we find a significant difference between the means of age at removal of the patients who developed a persistent GCF versus those who did not. Table 1 shows a summary of these results.

## DISCUSSION

In the care of children with a variety of diseases, a feeding gastrostomy is a useful and even lifesaving measure [4]. Gastrostomies in children can be the cause of several well-known complications [5], such as gastroesophageal reflux disease, gastrostomy leak and persistent gastrocutaneous fistula [6].

Previous authors defined a persistent GCF as a fistula between the skin and the stomach that had not closed 1 month after removal of the gastrostomy device [3,4]. We used the same arbitrary threshold of 30 days in the present study.

The prevalence of persistent GCF in this study (44%) lies within the range of previous ones (16% to 45% [2-4,7-10]) (table 2). However, we believe this incidence to be an overestimate in the present study. This is due to the fact that the date of spontaneous closure in many patients was not the actual day of closure, but rather the day on which the child came back for a postoperative control and the gastrostomy was found to be closed. An additional reason for overestimating the incidence of GCF is that many of the 140 patients dismissed because of a lack of follow-up are probably those with spontaneous closure, who could have increased the number of cases in group 1.

We found no other factor to be significantly associated with the persistence of a GCF. Janik et al. [4], whose study included 437 children over a 10-year period, and who analyzed 10 clinical parameters (including age less than 4 months at the time of GCF creation, concomitant fundoplication, concomitant steroids, gastrostomy tube type and chemical composition and intragastric configuration of the gastrostomy tube) for correlation with a persistent GCF, came to the same conclusion.

Although it has been assumed that the incidence of persistent GCF is lower with PEG than with surgical gastrostomies [7], we found no association between the type of gastrostomy and the persistence of a GCF. This can be explained by the fact that there was a high percentage of surgical gastrostomies in our study population (79%, vs. 21% PEG), which was due to the large proportion of children who required a gastrostomy because of caustic esophageal stenosis (CES, 60%) (figure 2). The length of time the gastrostomy was left in place was very significantly shorter in patients in which CES was the reason of gastrostomy placement, versus in those who required a gastrostomy for other reasons (19 vs. 31 months,  $P = 0.004$ ). The gastrostomy orifice closed also significantly faster in CES patients than in the others (51 vs. 215 days,  $P = 0.02$ ), which concurs with our results regarding the association between duration of gastrostomy use and non-closure of the stoma. Consequently, the incidence of persistent GCF was higher in children whose gastrostomy was a PEG (58%) than in those who had had the surgical variant (38%).

Recommendations regarding the timing of surgical closure vary between authors. Davies et al. [11], whose study population were children who had undergone successful renal transplantation, recommended elective surgical closure of all gastrostomies maintained in place for more than 1 year in that group of patients. El-Rifai et al. [2] however suggested optional elective closure 1 month after removal of the gastrostomy device. We agree with the latter recommendation, as the gastrostomy in 51 % of the patients in the present study closed spontaneously before the end of the 5<sup>th</sup> week, and probably in some of them long

before that, for aforementioned reasons (figure 3). There has also been reported success with nonsurgical methods of closure, using argon plasma coagulation and endoscopic hemoclips [12], fibrin sealant [13], or the tissue adhesive 2-octylcyanoacrylate [14].

Physicians ought to be aware that gastrostomy devices should not be held in place longer than necessary, since the duration of gastrostomy placement appears to be the main risk factor associated with the development of a persistent GCF.

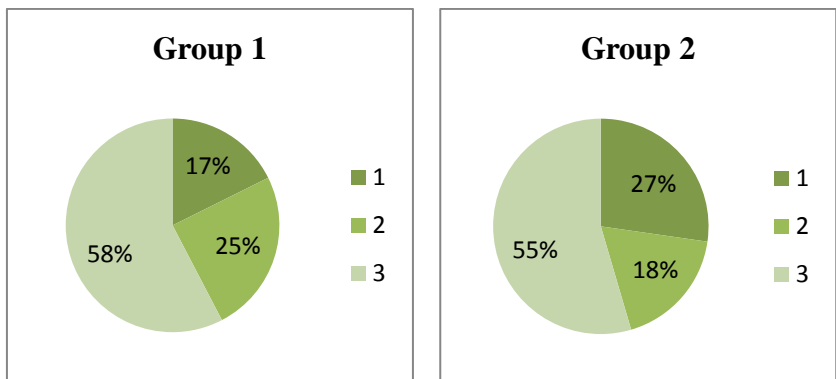
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**Figure 1.** Gastrocutaneous fistula (GCF).

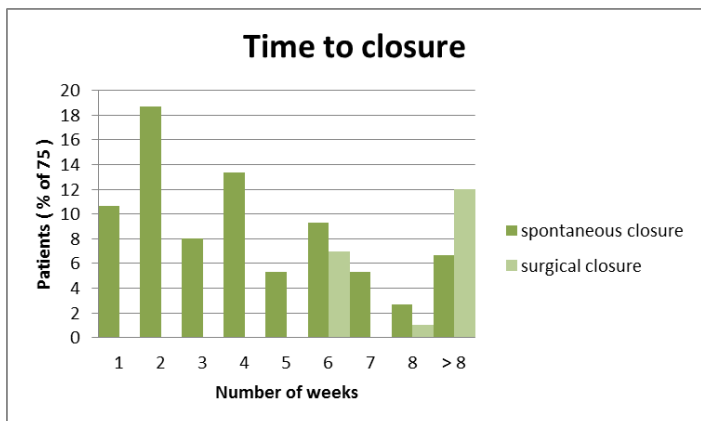


**Figure 2.** Underlying disease in children with no persistent GCF (group 1) and with a persistent GCF (group 2).



1: Swallowing disorders. 2: Inadequate nutrient intake. 3: Mechanical causes.

**Figure 3.** Time to closure of the gastrostomy orifice in patients with spontaneous closure (dark) and with surgical closure (light).



**Table 1.** Summary of the results.

	No persistent GCF	Persistent GCF	
	n = 42	n = 33	P value
<b>Sex, male:female, n</b>	25:17:00	21:12	ns
<b>Mean time to closure, days</b>	17±8	244±507	
<b>Mean age at removal, months</b>	70±36	72±50	ns
<b>Age at removal, n</b>			
< 3 years	6	6	ns
3 - 6 years	20	14	
> 6 years	16	13	
<b>Mean duration of gastrostomy, months</b>	19±28	30±27	ns (0.08)
<b>Duration gastrostomy in place, n</b>			
< 1 year	27	11	0.02
1 - 2 years	4	4	
> 2 years	11	18	
<b>Underlying disease, n</b>			
<i>Swallowing disorders</i>	4	7	ns
<i>Inadequate calorie intake</i>	7	8	
<i>Mechanical causes</i>	31	18	
<b>Type of gastrostomy, n</b>	n = 33*	n = 24	
<i>Surgical, open</i>	24	12	
<i>Surgical, laparoscopic</i>	4	5	
<i>PEG</i>	5	7	ns

Group 1: no persistent GCF. Group 2: persistent GCF.

\*: Type of gastrostomy was unknown in 18 patients.

**Table 2.** Comparison of literature.

Study	No. of patients	Age at insertion	Gastrostomy type	Spontaneous closure, n (%)	Mean time to closure	GCF, n (%)
Haws et al., 1966 [9]	141	Neonates and infants	Surgical	99 (70)	3 months	26 (18)
				5 (3)	> 3 months	
Holder et al., 1972 [10]	10	< 2 weeks in 50% patients	Surgical	6 (60)	—	4 (40)
Aronian, Redo, 1974 [8]	20	1 day — 2 years	Surgical	11 (55)	1 week — 1 year	9 (45)
Gordon, Langer, 1999 [3]	32	—	18 surgical, 14 PEG	18 (56)	—	14 (44)
Kobak et al., 2000 [7]	54	2 weeks — 15 months	PEG	41 (76)	< 11 months	13 (24)
Davies et al., 2001 [11]	18	0.9 — 13.9 years	Surgical	11 (61)	—	7 (39)
EL-Rifai et al., 2004 [2]	44	1 day — 14 years	14 surgical, 26 PEG	37 (84)	53 days	7 (16)
Janik et al., 2004 [4]	437		422 surgical, 15 PEG	287 (66)	4.5 months (no GCF), 29.3 months (GCF)	150 (34)
Present study	75	5 months - 17.5 years (age at removal)	45 surgical, 12 PEG, 18 unknown	42 (56)	4 months (median 23 days)	33 (44)