

Outpatient endoscopic closure of persistent gastrocutaneous fistula with hemoclips in pediatric patients

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Gastrostomy tubes (GTs) are used in children who have difficulty tolerating oral nutrition, but the tubes are often not needed permanently. When a GT is no longer required, it can be removed at the bedside or endoscopically, and the tract will often close after cauterization. However, persistence of the gastrocutaneous fistula (GCF) with leakage of food and liquid is common. In 1 retrospective pediatric review, 16% of patients required surgery for closure of a GCF after GT removal.¹ Unfortunately, pediatric patients who require surgery for fistula closure are often admitted to the hospital postoperatively and are given nothing by mouth to allow the tract to close. This is both costly to the health care system and time-consuming for the family. Adult gastroenterologists have reported the successful use of endoscopic hemoclips with and without cautery or argon plasma coagulation to close persistent GCFs.²⁻⁵ In these reports, however, patients were typically admitted to the hospital postoperatively for intravenous hydration and for a period of fasting. This case series describes results of 11 endoscopic closures of GCFs by using hemoclips without postoperative hospital admission and is one of very few to describe this technique in pediatric patients.⁶

PATIENTS AND METHODS

Patient selection

This was a retrospective case review performed at a large academic pediatric hospital. Patients were included in this case series if they underwent the endoscopic closure of a GCF by using hemoclips and their guardians verbally consented to inclusion (IRB-AAAL7114). All pa-

tients were identified by physician recollection, and the patients' endoscopic and electronic medical records were reviewed from June 2010 to March 2014. Specific patient characteristics and outcomes can be found in [Table 1](#).

Protocol

Once it was decided that a GT was no longer necessary and the patient was sustaining optimal nutritional status via oral intake alone, the GT was removed at the bedside. The tract was then cauterized with silver nitrate, covered with gauze and a clear dressing, and the patient was instructed not to eat or drink for 2 to 4 hours. At the discretion of the patient's pediatric gastroenterologist, patients were started on a proton pump inhibitor to decrease the amount of acidic drainage from the GCF and to aid in tract closure. In patients with persistent leakage from the GCF, silver nitrate was often attempted again. If leakage persisted for more than 2 weeks after silver nitrate application and no active GT site infection was present, the patient was then considered for endoscopic closure.

After informed consent was obtained, a pediatric endoscope (with a 2.8-mm channel) was introduced into the stomach, and the GCF was brought into view. In most cases, the GT tract was thoroughly cauterized with a bipolar probe externally from the stoma site and internally via the endoscope. Two to 4 hemoclips were then applied to approximate the edges of the fistula site. Of note, the hemoclips used were either the Resolution Clip by Boston Scientific (Natick, Mass) or the Tri-Clip by Cook Medical (Bloomington, Ind). Both hemoclip brands are magnetic resonance imaging conditional. The choice of hemoclip was at the discretion of the attending pediatric gastroenterologist, but only patient 6 had the TriClip placed. Patients were discharged from the recovery area on the same day with instructions not to drink liquids for 30 minutes to 4 hours after the procedure and then to resume a regular diet. Patients with persistent leakage postoperatively were again cauterized with silver nitrate externally and were offered the choice of a repeat endoscopic procedure or referral for an open surgical closure.

RESULTS

All patients who underwent the endoscopic clipping procedure had uncomplicated endoscopies and were

Abbreviations: GT, gastrostomy tube; GCF, gastrocutaneous fistula.

DISCLOSURE: All authors disclosed no financial relationships relevant to this article.

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0016-5107/\$36.00

<http://dx.doi.org/10.1016/j.gie.2014.07.046>

Received June 2, 2014. Accepted July 17, 2014.

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TABLE 1. Patient characteristics at the time of endoscopic gastrocutaneous fistula closure and postprocedure outcomes

Pt.	Age, y, at procedure	Sex	Comorbidities	Length of time GT was in place, y	GT and stoma length	Method of closure	Outcome
1	17	F	Cystic fibrosis, s/p lung transplant	8	18F, 2.4 cm	Bipolar tract cauterization, 4 hemoclips	Closure
2	12	F	ASD, Wolff-Parkinson-White syndrome	10	18F, 1.7 cm	Bipolar tract cauterization, 2 hemoclips	Closure
3	12	M	Tracheoesophageal fistula s/p repair	12	16F, 1.5 cm	Bipolar tract cauterization, 4 hemoclips	Closure
4	7	M	Hepatoblastoma s/p liver and renal transplants	5	18F, 2.4 cm	2 hemoclips	Closure
5	4	F	Neuroblastoma s/p stem cell transplant	2	18F, 1.7 cm	Bipolar tract cauterization, 2 hemoclips	Closure
6	9	F	History of jejunal atresia	8	18F, 1.7 cm	1. Silver nitrate externally, 2 hemoclips 2. Bipolar tract cauterization, 2 hemoclips	Scant leakage 6 wk post-closure that persisted despite silver nitrate application. Repeat endoscopic closure was successful.
7	9	F	Prematurity (23 wk), chronic lung disease, s/p tracheostomy, GERD s/p Nissen fundoplication	9	16F, 1.5	Bipolar tract cauterization, 7 hemoclips deployed, but only 2 remained attached to the gastric mucosa	Unable to completely close tract at the time of the procedure; surgical procedure performed
8	3	M	PFIC, s/p liver transplant with a history of acute rejection and EBV infection	2	18F, 1.7 cm	3 hemoclips	Scant leakage that resolved with silver nitrate treatment at 2 wk
9	4	M	Congenital diaphragmatic hernia, also s/p fundoplication	3	12F, 1.5 cm	Bipolar tract cauterization, 2 hemoclips	A small amount of intermittent leakage noted after 2 mo; surgical closure performed
10	11	M	DORV s/p repair, developmental delay	10	14F, 1.7 cm	Bipolar tract cauterization, 3 hemoclips	Leakage persisted; surgical closure performed
11	4	F	Noonan syndrome	3	18F, 1.7 cm	Bipolar tract cauterization, 3 hemoclips	Closure

Pt, Patient; GT, gastrostomy tube; F, female; ASD, atrial septal defect; M, male; s/p, status post; PFIC, progressive familial intrahepatic cholestasis; EBV, Epstein-Barr virus; DORV, double-outlet right ventricle.

sent home after routine observation. This technique permanently closed the GCF in 8 of 11 patients, although 1 of these 8 patients required a repeat endoscopic clipping. Five patients had complete closure of the GCF without any

persistent drainage after the initial procedure, and 2 patients had scant leakage that resolved within 2 weeks. In 1 case of failure (patient 7 in Table 1), it was evident during the procedure that the sides of the fistula could not be

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