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Efficacy of Endoscopic Clips in the Treatment of Gastrocutaneous Fistulas Following Gastrostomy Tube Removal



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Background: Persistent gastrocutaneous fistula (GCF) following percutaneous endoscopic gastrostomy (PEG) tube removal often require surgical intervention for successful closure which increases the morbidity and mortality associated with this condition. The growing use of endoscopic clips to close fistulas has become an effective and less invasive treatment modality. We report successful closure of four out of five persistent GCFs following gastrostomy tube removal using endoscopic clips.

Methods: This is a retrospective case review from 12/2008-6/2012. Five adult, non-elderly patients from Tampa General Hospital, Tampa, Florida developed GCFs following gastrostomy tube removal and received subsequent endoscopic treatment using Resolution™ endoclips. Gold Probe multipolar electrocoagulation was used in two patients to de-epithelialize the fistula tract prior to clip placement.

Results: Five patients with a mean age of 53.6 ± 16.3 (range 26-66) presented following PEG tube removal with persistent GCF. PEG tubes remained in place for an average of 8.2 months (range 5-10 months). Fistulas were present for an average of 3.8 months (range 1-6 months) prior to attempted closure. Endoscopic closure was successful in four of five patients as confirmed via esophagoduodenoscopy (EGD) within a period of two months. Two of the closures were performed with the addition of endoscopic cautery using a Gold Probe. Two of the closures were performed without cautery. The unsuccessful closure was performed without the use of electrocautery on a non-compliant patient with severe deconditioning and compromised immune status.

Conclusions: The technique of endoscopic closure of gastrocutaneous fistulas using clips either with or without cautery provides an effective, safe and less invasive treatment modality that may negate the need for surgical intervention. Prospective studies are needed to determine if de-epithelialization of the tract is necessary for successful closure.

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INTRODUCTION

PEG tubes play an important role in maintaining supplemental enteral nutrition in patients who are unable to obtain adequate nutritional status. Upon removal of a gastrostomy tube, spontaneous closure usually occurs. However, refractory gastrocutaneous fistulas are a known consequence following gastrostomy removal. The incidence of persistent GCFs has been reported as less than 10%¹ however, an incidence as high as 44% has been reported in a pediatric population.² The pediatric study also reported a mean time from insertion of the PEG tube to removal of 29.8 months in the GCF group, compared to 6.5 months in the spontaneous closure group. Therefore, the increased incidence of persistent fistulas may be secondary to longer periods of time the PEG tubes are in place.

Conservative management for GCFs, including acid suppression and pro-motility agents, has had limited success. As a result, surgical laparotomy and excision of the fistula track is often required. New technology and advances in non-surgical techniques for gastrocutaneous fistulas are developing and include percutaneous endoscopic suturing,^{4,5} application of collagen plugs,⁶ and injection of fibrin sealant or fibrin glue.^{7,8} Surgical correction is increasingly being used now for GCFs intractable to previous, less-invasive modalities.

The first use of endoscopic clips, in 1975, was reported for hemostasis in GI bleeding.⁹ Use for other indications is rapidly accumulating and includes closing fistulas and perforations, radio-opaque markers, biliary cannulation, and the anchoring of stents, catheters or feeding tubes. Additionally, evidence for the effectiveness of clips in endoscopic closure of gastrocutaneous fistulas is increasing. Previous reports have shown efficacy in children¹⁰ and elderly patients,¹¹ and isolated reports have shown efficacy with¹² and without^{13,14,15} the use of cauterization. We report a case series in an adult population of an emerging nonsurgical approach to close persistent enterocutaneous fistulas following gastrostomy removal with and without the use of endoscopic cautery.

Methods

Five consecutive patients with persistent gastrocutaneous fistulas (range 1-6 months) were treated with placement of endoscopic clips. Esophagogastroduodenoscopy with visualization of the internal GCF tract was performed

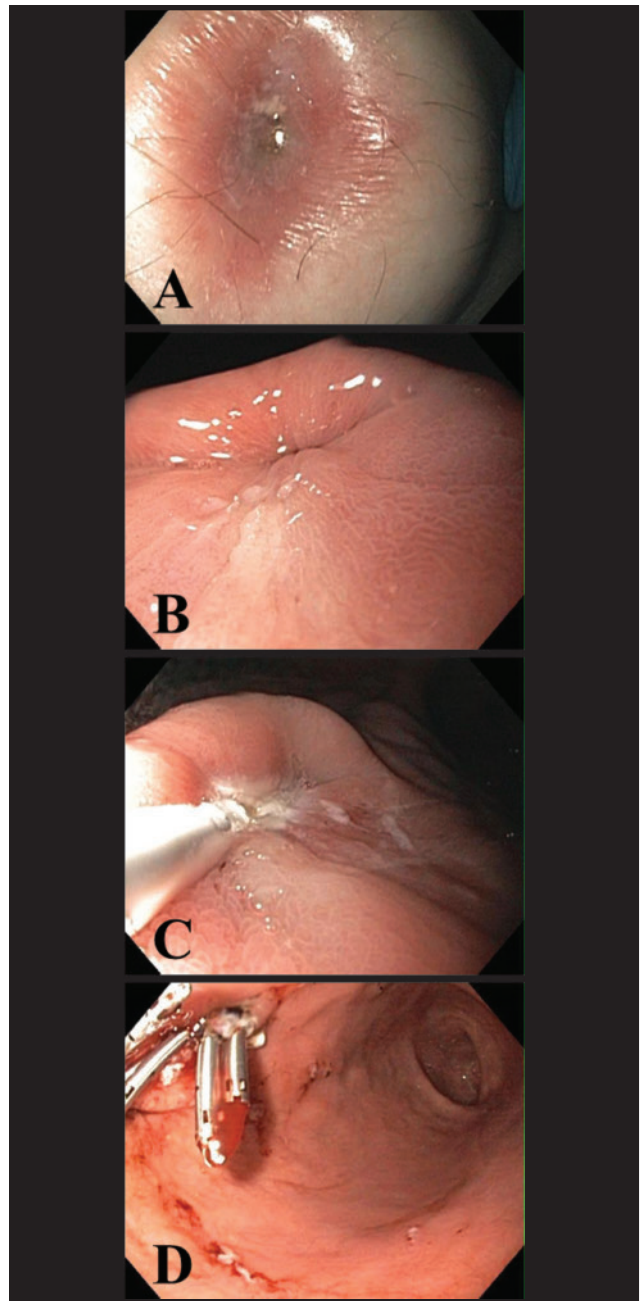


Figure 1. **A.** External opening of gastrocutaneous fistula. **B.** Endoscopic view of gastrocutaneous fistula. **C.** Gold probe cautery used to denude the tract and adjacent mucosa. **D.** Edges of mucosal wall approximated with endoclips.

on all five patients. A 7F multipolar probe (Gold Probe™ Boston Scientific, Natick, MA) was used to circumferentially de-epithelialize the fistulous tract in two of the patients prior to clip placement. The margins of the fistulous tracts were approximated using 3-6 Resolution™ endoclips (Boston Scientific, Natick, MA) (Figure 1). Following the procedure, patients

were instructed to remain NPO for three days. Gradual advancement of an oral diet was initiated as tolerated on day four. Follow-up endoscopic examinations (Figure 2) were performed to confirm fistula closure within 10 days-2 months of clip placement. Patients who failed to close after one session were offered a second clipping session.

Results

All patients in the study were adults with a mean age of 53.6 years \pm 16.3 (range 26-66 years). Four of the five patients were male. All had previous PEG tubes in place for a mean time period of 8.2 months (range 5-10 months). Indications for PEG tube placement included: radiation-induced esophageal stricture, craniofacial trauma, dysphagia and malnutrition. After removal of PEG tubes, leaking GCF's were present for a mean duration of 3.8 months (range 1-6 months). Conservative measures including topical silver nitrate, external sutures, proton pump inhibitors, total parenteral nutrition, and parenteral antibiotics were unsuccessfully attempted in all patients prior to endoscopic clip placement. Two of the patients had dual use of their PEG for feeding, and for retrograde esophageal dilation of tight cervical esophageal strictures using Tucker dilators.¹⁶

The application of endoscopic clips to close persistently draining gastrocutaneous fistulas refractory to conservative management resulted in complete closure in four out of five patients (80%). The use of gold probe cauterization prior to clip placement resulted in GCF closure in two out of two patients (100%). Successful closure is illustrated in Figure 1 and 2. Zero patients experienced adverse, post-procedure complications. The mean diameter of internal fistulous tracts was 1.26 cm (range 0.8–2cm). The largest fistula to close was estimated to be 1.5 cm in diameter. Two to six clips were deployed per endoscopic session. Details of each case are listed in Table 1.

Three patients required only one endoscopy with clip deployment to close the GCF. Two of the five patients required a second endoscopic session with repeat clip application (patient's number 4 and 5) due to incomplete fistula closure after the first attempt. The second session was successful in one out of the two patients (patient number 4). Two clipping sessions were required in patient number 4 due to difficulty passing an adult endoscope (Olympus GIF H180) beyond the patient's esophageal stricture on the initial attempt.

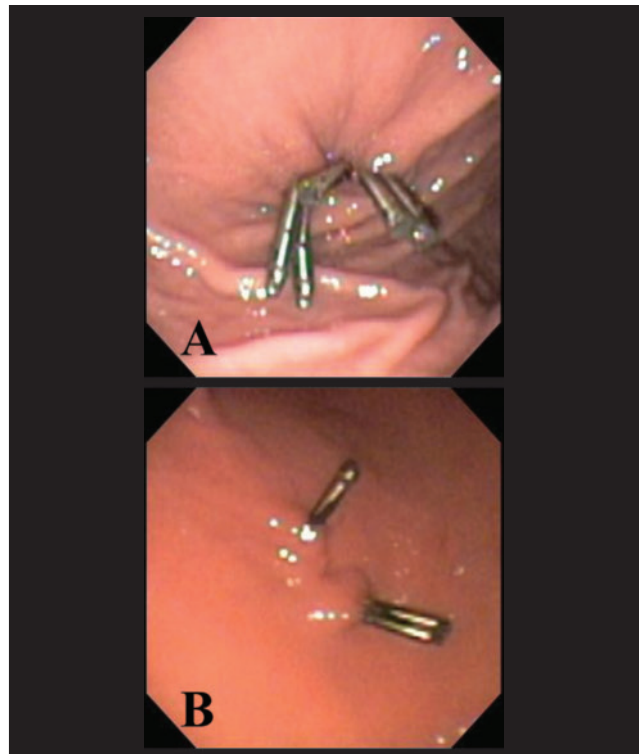


Figure 2. A. Endoscopic view showing closure of the gastrocutaneous fistula three weeks after electrocautery and clip placement. **B.** Further healing of the gastric mucosa six weeks after electrocautery and clip placement.

Three clips were initially deployed with visualization provided by a pediatric endoscope (Olympus GIF XP160) and the clip fixing device passed alongside, but this resulted in suboptimal clip placement and failed closure. Successful closure was subsequently obtained seven days later following further stricture dilation, which allowed passage of the adult endoscope, and optimal deployment of four additional clips.

Two clipping sessions were required in patient number 5 after initial placement of four clips and subsequent placement of three clips eleven days later. Both sessions were unsuccessful in fistula closure and likely due to poor immune and nutritional status secondary to HIV and to the patient immediately resuming an oral diet against medical advice. In addition, this patient had the largest fistula, estimated to be 2 cm in diameter. One month after his second procedure, the patient returned with continued GCF drainage. At that point, further endoscopic intervention was deemed futile and a surgical consult was placed. However, the patient signed out of the hospital prematurely against medical advice and was eventually lost to follow-up.

Table 1. Patient Demographics and Study Parameters

Patient	1	2	3*	4*	5
Age	65	26	66	57	54
Sex	M	M	M	F	M
Indication for PEG Placement	Malnutrition	Craniofacial Trauma	Esophageal Stricture	Esophageal Stricture	Malnutrition
Length of Time PEG in Place (months)	5	10	10	10	6
Age of Fistula Prior to Clipping (months)	5	6	1	1	6
Size of Fistula (cm)	1.5	1	0.8	1	2
Number of Clips Placed	6	4	6	3&4	4&3
Number of Clipping Sessions	1	1	1	2	2
Use of Cautery?	No	Yes	Yes	No	No
Successful Closure?	Yes	Yes	Yes	Yes	No

* G-tube tract was used for Tucker dilation of tight esophageal strictures.

DISCUSSION

Development of a persistent gastrocutaneous fistula is a well-known complication of gastrostomy removal that can be very difficult to manage. Persistent leakage from the GCF can lead to severe local skin irritation, local infection, sepsis, and electrolyte disturbances.¹⁷ Despite conservative management, surgical intervention is frequently required, however this increases the risk of morbidity and mortality, especially in debilitated patients.

The use of endoscopic clips to close GCFs is a promising alternative to surgery. In the present case series, our four successful closures illustrate the effectiveness of using endoscopic clips as a means of closing GCFs following gastrostomy removal. The stainless steel Resolution™ endoclips used on our patients have prongs which, when fully opened, measure 11 mm. The clipping technique involves grasping the mucosal, and submucosal tissue layers

at the orifice edges and approximating the opposite walls, thus leading to macroscopic closure of the fistula opening. This method eliminates injury to surrounding tissues and allows for improved closure of the fistula.

Another clip, the Over the Scope Clip (OTSC, Ovesco AG, Germany) is a newer, larger clip placed over the endoscope and deployed to close various types of perforations and fistulas. It first became available in Europe in 2010 and in the US in 2012. There are several case reports^{18,19} of its use in gastrocutaneous fistulas but efficacy in larger series has not been documented. Compared with standard endoclips, the OTSC has demonstrated a higher rate of full-thickness closures and the ability to close larger defects, up to 30mm.¹⁸ However, use of the OTSC is less cost-effective than standard endoclips and fistulas with severe fibrotic changes have been shown to limit the ability to draw tissue into the applicator tip, precluding successful OTSC placement.¹⁹ Therefore, when standard endoclips

fail, especially in larger fistulas, the use of an OTSC is a reasonable option. The OTSC was not used in our study as it was not available in the U.S. at the time of the unsuccessful closure in August of 2009.

Gastrocutaneous fistulas may be particularly difficult to close due to their chronic and fibrotic nature with epithelialization of the fistula tract. For this reason, the application of endoscopic cautery to de-epithelialize the tract prior to bringing the edges together may encourage fistula closure by removing the epithelial lining, damaged tissue, foreign material and bacteria that inhibit healing. Unlike chronic wounds, acute wounds are able to proceed quickly through the normal stages of the healing process: inflammation, proliferation and maturation.²⁰ However, chronic wound progression along this path may become arrested. Surgical concepts of wound healing have shown that a chronic wound must be converted by debridement to an acute wound in order for it to proceed through the normal healing phases.²¹ Inducing mucosal injury prior to endoscopic clipping either with argon plasma coagulation,²² multipolar electrocautery¹⁰ or heater probe¹¹ may convert the wound from chronic to acute and encourage the edges of the fistula to seal. In the present case series, this theory is supported by the observation that both patients who received endoscopic cautery prior to clip placement experienced successful closure. However, two patients who did not receive cautery also experienced successful closure, thus indicating that cautery may be helpful but is not essential to endoscopic clip closure. Two patients in this series had their PEG tracks used for Tucker dilation which may have contributed to the persistence of the fistula by enlarging the tracks, inducing injury and subsequent fibrosis, and encouraging epithelialization.

Several factors may have contributed to the unsuccessful closure reported in the fifth case with the largest fistula. Cautery was not used on this patient and it is possible that the mucosa was too densely epithelialized to heal without prior disruption. Mucosal healing may have been hindered by the patient's non-compliance with NPO diet, poor nutrition and compromised immune status. Inadequate clip placement or early clip detachment due to the large fistula size may have also played a role.

The use of endoscopic clips in the closure of gastrocutaneous fistulas following gastrostomy removal is a valuable, safe & effective technique that may become the standard of gastrocutaneous fistula management prior to considering surgical intervention.

Further studies are warranted to confirm the efficacy of endoscopic clips alone or in conjunction with prior cauterization. ■

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