

# Endoscopic Hemoclip Treatment for Gastrointestinal Bleeding

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We conducted an uncontrolled study to evaluate an improved metallic clip (Olympus hemoclip) for the endoscopic treatment of nonvariceal gastrointestinal bleeding. A total of 88 patients (mean age  $63 \pm 14$ , 60 males) with bleeding from a wide range of sources were treated. Seventy-eight patients had active bleeding (spurting in 50, oozing in 28) and 10 patients had a nonbleeding visible vessel. Initial hemostasis was achieved in all patients with active bleeding. A total of 255 clips were placed (average of 2.9 clips per patient, range of 1-10 clips). Spurting arterial bleeders required more clips on average than oozing bleeders (3.2 versus 2.7); active bleeders required more clips than cases with nonbleeding visible vessels (3.0 versus 2.2). Mean follow-up was  $397 \pm 148$  days. Recurrent bleeding was observed in 5 patients, all of whom had active bleeding on initial presentation. Rebleeding was successfully treated with hemoclips in 4 patients and one patient underwent surgery. Clips appeared to be retained well; early clip dislodgement resulted in rebleeding in only 1 patient. No complications resulted from this treatment. Clips did not impair healing of peptic ulcers. We conclude that endoscopic hemoclip placement is a highly effective and safe method for treating nonvariceal gastrointestinal bleeding and deserves comparative studies with other methods of endoscopic hemostasis.

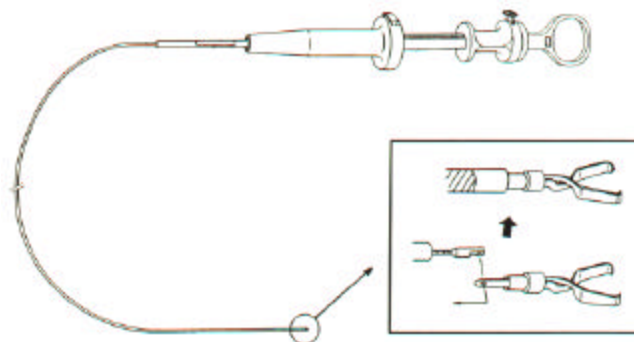


Figure 1: Hemoclip application device consisting of handle and sheath with an inner cable. Insert shows attachment of a hemoclip to the tip of the cable.

Conceptually, mechanical hemostasis by the application of a metal hemoclip to a bleeding vessel is an appealing alternative to the currently available techniques. The bleeding vessel is ligated, thus achieving an immediate hemostatic effect analogous to surgical ligation. Hemostasis is definitive if the vessel is properly ligated. Injury to the surrounding tissue is minimized owing to the targeted application of the clip to the bleeding vessel.

A method for endoscopic hemostasis using a metallic clip was introduced by Hayashi nearly two decades ago in Japan (14). Initial experience was discouraging owing to the complicated technique of clip application and low retention rates. More recently, technical improvements of both the clip and clip delivery system have been introduced. The modified clips have been reported to be easier to place, to have a better grasping capability and to cause less tissue trauma (14,15). Hachisu reported permanent hemostasis of upper gastrointestinal bleeding in 84.3 % of 51 patients treated with modified hemoclips (15). We performed a prospective study to evaluate this improved metallic clip for hemostasis of gastrointestinal bleeding from a wide variety of sources.

## Methods

Over a two year period (1990-1992), a total of 88 patients with nonvariceal gastrointestinal bleeding were included in this study. There were 60 males and 28 females with a mean age of  $63 \pm 14$  years. All of the patients we selected had

## Introduction

Widely practiced endoscopic methods for nonvariceal hemostasis include thermal application (laser, heater probe, and Bicap) and local injection (epinephrine or various sclerosing agents). Studies evaluating these modalities for upper gastrointestinal bleeding (primarily peptic ulcers) have presented high success rates for achieving initial hemostasis (1). However, rebleeding has been reported to occur in 10-30 % of patients (2-7). A potential drawback of thermal methods and the injection of sclerosing agents is that these may cause excessive tissue injury leading to necrosis and perforation (8-13).

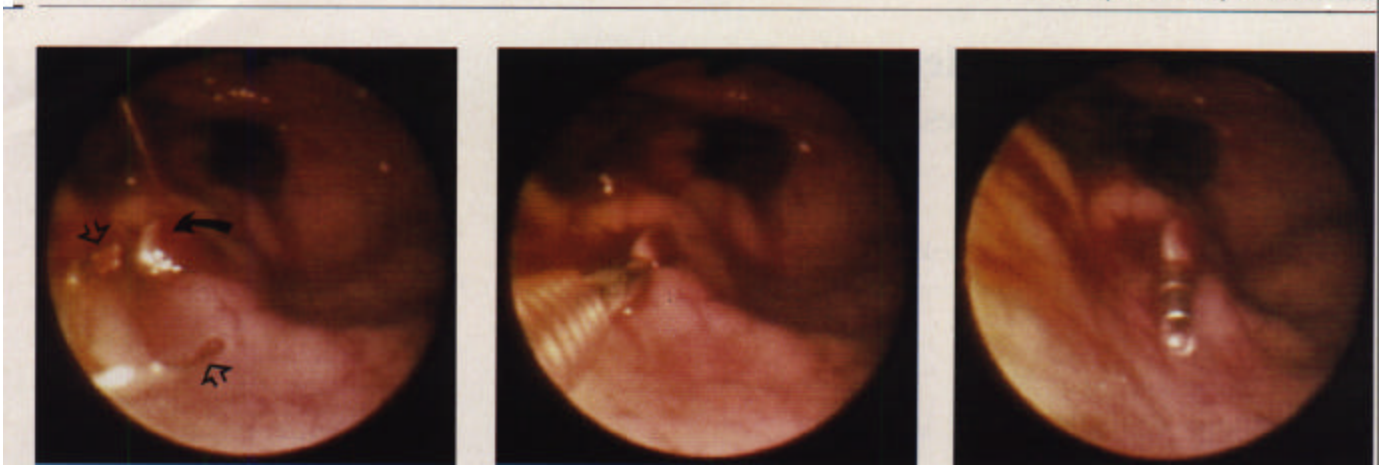


Figure 2a: Open hemoclip (open arrows) approaching a spurting artery (curved solid arrow).

Figure 2b: Hemostasis after application of the hemoclip.

Figure 2c: Hemoclip in situ after detachment.

Figure 2: Endoscopic views of hemoclip application for a bleeding gastric ulcer.

either active bleeding (spurting or oozing) on endoscopy or clinical documentation of hematemesis, hematochezia, or melena and a nonbleeding visible on endoscopy. Upper and lower endoscopy were performed on an emergency basis within 24 hours of hospital presentation for gastrointestinal bleeding. We excluded patients with bleeding from a large caliber (> 2 mm) artery and ulcers suspected of perforation. None of the patients had undergone prior endoscopic treatment of any kind. Most patients (89 %) had active bleeding,

of which 64 % had a spurting bleed. Sources of bleeding and bleeding activity are detailed in Table 1.

Endoscopy was performed in the standard fashion using the Olympus GIF-IT20 (3.7 mm working channel) and CFIT20I (4.2 mm working channel) endoscopes. Hemoclips (MD 850, Olympus Corp., Toyko) were made of stainless steel and had prongs which measured 6 mm in length and 1.2 mm in width. When fully open, the distance between the clip prongs measured 7 mm. Clips were applied with a clip application device (HX-3L, Olympus Corp., Tokyo) which can also be passed through a 2.8 working channel of a standard endoscope (Figure 1).

Table 1: Sources of gastrointestinal bleeding and bleeding activity (n=88).			
	Spurting	Oozing	Visible Vessel
I. Upper GI tract			
Peptic ulcer			
Gastric	6	3	5
Duodenal	4		
Esophageal	2	1	
Stomal ulcer	2	1	3
Mallory-Weiss tear	2		
Dieulafoy's lesion	1		
Gastric tumor		1	1
Gastric AVM	1		
II. Lower GI tract			
Colonic diverticulum	1		
Solitary rectal ulcer	1		1
Hemorrhoids	1		
III. Postprocedural			
Postpolypectomy			
Colon	24	18	
Stomach	3	4	
Postsphincterotomy	1		
Postbiopsy (tumor at gastric anastomosis)	1		
Total	50	28	10
GI = Gastrointestinal, AVM = Arteriovenous malformation			

Hemoclips were applied directly to the bleeding vessel (Figures 2,3). Vessels traversing the surface were clipped at both ends of the bleeding point (Figure 4). The orientation of the opened clip was adjusted by rotating the applicator handle.

Patients with upper gastrointestinal ulcers received acid suppressive therapy and underwent follow-up endoscopy on a weekly basis. A clear ulcer base (including dislodgement of the clip) was ascertained before hospital discharge. Emergency endoscopy was performed if there was clinical suspicion of rebleeding. All other patients did not undergo followup endoscopy unless clinically suspected of having recurrent bleeding.

## Results

A total of 255 clips were placed (average of 2.9 clips per patient). Sixteen patients received a single clip, 55 patients two to three clips and 17 patients four or more clips. The maximum number of clips applied was ten (one patient). Initial hemostasis was secured in all patients with active

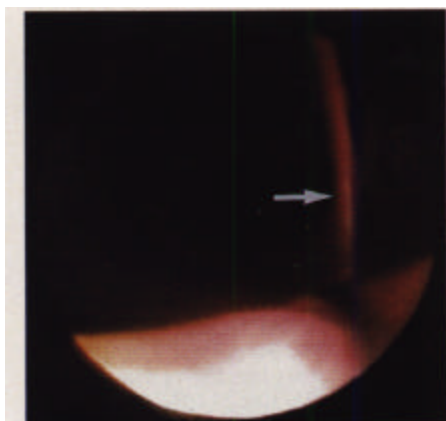


Figure 3a: Spurting arterial bleed (arrow) after snare excision of a 2 cm pedunculated polyp

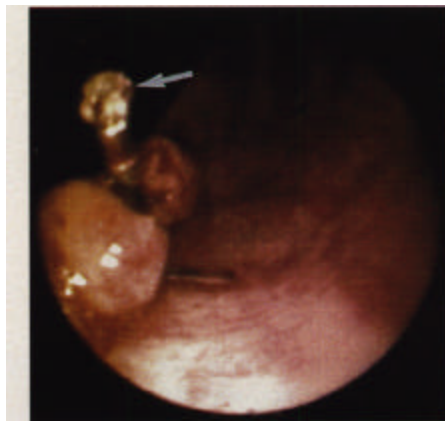


Figure 3b: Hemostasis after application of 1 hemoclip (arrow) to the bleeding vessel at the polyp stalk.

Figure 3: Endoscopic views of hemoclip application for a postpolypectomy bleed.

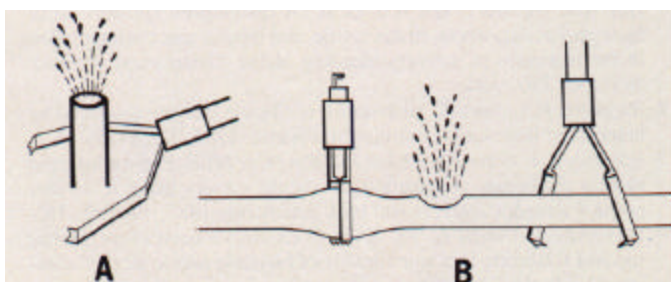


Figure 4: Graphic representation of hemoclip application to a bleeding vessel. A: Protruding vessel. B: Clips applied at both ends of a bleeding vessel.

bleeding. Patients with a spurting arterial bleed required more clips to achieve hemostasis on average than those with an oozing bleed (3.2 versus 2.7). Active bleeding required more clips on average than nonbleeding visible vessels (3.0 versus 2.2). In the first seven patients we encountered with active bleeding, epinephrine (1 : 20,000) was injected around the bleeding site as a preliminary step to reduce bleeding. In subsequent patients, hemostasis was achieved with hemoclips alone. Hemoclip placement did not precipitate active bleeding in any of the patients treated for a nonbleeding visible vessel.

The mean follow-up was  $397 \pm 148$  days. Recurrent bleeding occurred in five patients. Sources of rebleeding were peptic ulcers in three patients, an esophageal ulcer in one patient and a postpolypectomy bleed in one patient. All of these patients had had active bleeding at the time of initial presentation. Recurrent bleeding occurred 1-8 days after hemoclip treatment. In one patient with a gastric ulcer, the cause of rebleeding was dislodgement of the original clip placed two days earlier. In the remaining four patients, oozing was noted alongside the previously applied clips. Recurrent bleeding was treated by hemoclips in four patients and resulted in permanent hemostasis; one patient had massive bleeding and was referred for emergency surgery. None of the patients with nonbleeding visible vessels had recurrent bleeding.

Follow-up endoscopy of patients with bleeding upper gastrointestinal ulcers showed no evidence of clip-induced tissue injury or impairment of ulcer healing. Clips were observed to dislodge spontaneously with reepithelization of the ulcer base. This occurred 1-3 weeks after placement. The clips were passed in the feces without any complication.

#### Discussion

The results of this study confirm the efficacy and safety of hemoclips for the treatment of gastrointestinal bleeding as reported previously by Hachisu (15). Hemoclip placement was technically successful in all patients treated. Initial hemostasis was achieved in 100 % of the cases and the rebleeding rate was low (5 %). No complications resulted from clip placement. Based on follow-up endoscopy in patients with peptic ulcer bleeding, the clips were well retained. Early dislodgement of a clip resulting in rebleeding was observed in only one case. Clips did not appear to impair healing of ulcers. The number of hemoclips required for hemostasis depended upon the bleeding activity, endoscopic accessibility of the bleeding site and anatomy of the vessel. Spurting lesions generally required a larger number of clips to achieve hemostasis than oozing lesions, and active bleeding required more clips than nonbleeding visible vessels. It was usually technically more difficult to clip a vessel when the angle of approach was tangential. When the vessel traversed the surface, it was necessary to place at least two clips to ligate the vessel proximally and distally to the bleeding point. In the initial phase of this study, we injected epinephrine around the bleeding site in seven patients to reduce bleeding prior to clip placement. Subsequently, this was not found to be necessary and hemoclips were applied directly to the bleeding point, grasping a maximal amount of submucosal tissue between the clip prongs. In some cases, this necessitated the placement of many clips (18 patients required 4 or more clips; 10 clips were applied in one patient).

We encountered several technical difficulties with the hemoclip delivery system. Loading of the clip onto the application device was cumbersome and time consuming - a particular drawback in the setting of active bleeding. We therefore recommend that clips be preloaded and ready for delivery before starting the endoscopic examination. Because multiple clip placement is often necessary, it is advantageous to have at least two application devices available, allowing for reloading by an assistant while one device is in use. Transfer of torque from the applicator handle to the clip was poor after the application device had been inserted through the endoscope which made it difficult to change the orientation of the opened hemoclip. A more effectively torqueable applicator system is desirable.

Prior studies evaluating endoscopic modalities for gastrointestinal hemostasis have focused primarily on their application for bleeding peptic ulcers. The results of this study broaden the indications for endoscopic treatment using hemoclips.

We applied hemoclips for a wide variety of upper and lower gastrointestinal bleeding sources. The endoscopic management of postprocedural bleeding deserves particular mention as this has received little attention in the literature. In our study, post polypectomy bleeding was a major indication for hemostatic intervention using hemoclips. Hachisu applied hemoclips after polypectomy in 29 patients, however, this was a prophylactic measure to prevent bleeding (15). We used hemoclips in one patient with a postsphincterotomy bleed and in one patient who developed a spurting bleed following biopsy of recurrent tumor at a gastric anastomosis.

In summary, endoscopic hemoclip treatment provides an effective and safe modality for securing hemostasis in gastrointestinal bleeding. Controlled studies will be required to compare the efficacy, safety, and costs of hemoclips with other endoscopic methods for controlling nonvariceal bleeding.

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