

Endoscopic hemostasis by using the TriClip for peptic ulcer hemorrhage: a pilot study

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Background: The feasibility, efficacy, and safety of the TriClip in the management of peptic ulcer hemorrhage in human beings are scarcely reported in the literature.

Objective: A pilot study was conducted to assess the feasibility, efficacy, and safety of the TriClip endoscopic clipping device in the control of peptic ulcer hemorrhage.

Design: Prospective evaluation.

Setting: Regional government hospital.

Patients: From July 2004 to January 2005, patients older than 16 years and with Forrest type I and IIa peptic ulcer hemorrhages were included in the study.

Interventions: TriClips were used for initial hemostasis. Salvage procedures, including adrenalin injection, heat probe application, argon plasma coagulation, or surgery will be carried out appropriately if TriClip failed to control bleeding alone. An endoscopy was repeated 24 hours later for the security of the TriClip and for any endoscopic evidence of recurrent bleeding. A follow-up endoscopy was performed 8 weeks later to assess ulcer healing.

Main Outcome Measurements: Procedure time, successful hemostatic rate, number of clips used, ulcer recurrent bleeding rate, complications, and ulcer healing rate were measured.

Limitations: No comparative arm; pilot study only.

Result: A total of 27 cases (11 women, 16 men) were included in the study, with a median age of 70 years (range 18-88 years). There were 19 cases of duodenal ulcer and 8 cases of gastric ulcer, with median size of 8 mm (range 2-20 mm). The rate of successful hemostasis in the first endoscopy by TriClips alone was 81.5% (22/27), with a median procedure time of 10 minutes (range 3-30 minutes). In the second endoscopy, the endoscopic recurrent bleeding rate was 14.8% (4/27) and the TriClips were found dislodged in 11 patients (40.7%). The permanent hemostasis rate was 67% (18/27). The overall failure rate was 33% (9/27). Three patients required blood transfusion before the first endoscopy. There was no morbidity or mortality observed in all cases. All ulcers healed after 8 weeks.

Conclusions: The use of the TriClip is feasible in the initial control of peptic ulcer hemorrhage. However, we could not detect any obvious advantages in arresting bleeding vessels by using this new clipping device. (Gastrointest Endosc 2008;67:35-9.)

Peptic ulcer hemorrhage is not uncommon and accounts for the majority of cases in patients presenting with signs and symptoms of upper-GI bleeding.¹ The

Abbreviations: DU, duodenal ulcer; GU, gastric ulcer; H pylori, Helicobacter pylori; Ia, ulcer with spurter; Ib, ulcer with active oozing; IIa, ulcer with thrombosed vessel seen; RUT, rapid urease test.

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introduction of endoscopic therapy significantly reduces the morbidity and mortality related to the bleeding episode and recurrent bleeding rate.^{2,3} It has become the first line of treatment for upper-GI bleeding.⁴ Various methods or techniques for endoscopic hemostasis are used worldwide, including injectational therapy with epinephrine, placement of a hemoclip, contact thermocoagulation, noncontact thermal therapy, or a combination.⁵ Satisfactory hemostasis was achieved in approximately 90% of

patients by using these methods, whereas the recurrent bleeding rate varies among different modalities, with the mortality rate ranging from 6% to 8%.⁶

Endoscopic hemoclips were first described by Hayashi et al⁷ in 1975 but were abandoned because of their complexity. It was reintroduced in 1988 by Hachisu,⁸ who developed a modified hemoclip. Since then, it has become one of the most important tools for controlling upper-GI bleeding. The reported initial hemostasis rate ranges from 85% to 100%, though the recurrent bleeding rate ranges from 5% to 20%.⁹ It carries a theoretical advantage of not injuring the gastric/duodenal tissue, which at times might be very friable. However, it is cumbersome to use, and its inferiority to tackle a bleeder at a tangential position makes it less versatile when compare with other methods.^{10,11}

The new TriClip endoscopic clipping device (Cook Endoscopy Medical GI Endoscopy, USA) tries to overcome the problems by its "3-prong clip" design, coupled with the ergonomic handling device to enhance orientation and performance efficiency. In animal models, TriClips were found to be comparable with other hemoclip devices in terms of hemostasis.¹² However, reports on its use in human beings are scarce in the literature. Herein, we report a pilot study conducted to assess the feasibility, efficacy, and safety of the TriClip endoscopic clipping device in the management of peptic ulcer hemorrhage.

PATIENTS AND METHODS

From July 2004 to January 2005, all patients older than 16 years and with Forrest type Ia, Ib, or IIa acute peptic ulcer bleeding were included in the study. Patients who were critically ill or hemodynamically unstable, or who had previous gastric surgery were excluded. All endoscopies were performed by senior endoscopists. The technique of TriClips placement was learned and standardized by training through the Pulsation Organ Perfusion simulator at our Minimal Access Training Centre before the start of the study.

Adherent blood clots covering the ulcer crater were either flushed or removed with a forceps to reveal any underlying bleeding/thrombosed vessels. A TriClip was applied directly onto the bleeder without prior epinephrine injection. There is no limitation to the number of clips to be used. TriClip failure is defined as failed hemostasis when applying TriClips for various reasons, including technical difficulty, fibrotic ulcers that cannot hold the TriClips, or an inability to place more clips over the prior clip, and having bleeding continue anyway.

Salvage procedures, such as epinephrine injection, heat probe application, argon plasma coagulation, or surgery, will be carried out immediately if a TriClip(s) alone failed to achieve complete hemostasis. Any TriClips that were applied will not be removed beforehand if these salvage procedures are indicated.

Capsule Summary

What is already known on this topic

- Endoscopic hemoclips control upper-GI bleeding, with initial hemostasis rates ranging from 85% to 100%, but they are cumbersome to use, particularly when bleeding occurs at tangential positions.

What this study adds to our knowledge

- For 27 patients with peptic ulcer hemorrhage who underwent TriClip endoscopic clipping for hemostasis, the initial success rate was 81.5%, but the recurrent bleeding rate at 24 hours was 14.8%.
- The clips dislodged in 11 patients, resulting in a permanent hemostasis rate of 67%.

The procedure time is defined as the total time taken from the opening of the commercial package of Triclips to the time that the Triclips completely stop ulcer bleeding or the time of conversion to other treatment modalities. Biopsy specimens were taken from the antrum of the stomach for histology and a rapid urease test (RUT) to confirm *Helicobacter pylori* status. In patients with gastric ulcers (GU), ulcer biopsy specimens were taken for histology to exclude malignancy. All patients underwent endoscopy 24 hours later to determine the retention rate of the Triclip and to look for any endoscopic evidence of recurrent bleeding. During hospitalization, intravenous proton pump inhibitor esomeprazole 40 mg daily was given until the patient resumed oral intake. Upon discharge, all patients with a confirmed *H pylori* status were given a standard triple therapy regimen for eradication of *H pylori*. Otherwise, a course of histamine-receptor antagonists was prescribed. A check endoscopy was performed 8 weeks later to assess ulcer healing.

Data obtained, including patient demographics, initial hemostatic rate, reasons for TriClip failure, recurrent bleeding rate, clips dislodged rate, and ulcer healing, were collected a proforma for subsequent analysis.

RESULTS

During the aforesaid period, 27 patients were included in this study. The demographic data and outcomes are tabulated in Tables 1 and 2 and summarized in Table 3. There were 11 women and 16 men, with a median age of 70 years (range 18-88 years); the median procedure time was 10 minutes (range 3-30 minutes). There were 8 cases of bleeding GUs, and 19 cases of bleeding duodenal ulcers (DU) during the study period. Twelve patients had Forrest Ia ulcers, whereas 3 patients had Forrest Ib ulcers, and the remaining 12 patients had Forrest IIa ulcers.

The median number of clips used was 1.0 (range 1-2) to tackle the ulcers with a median size of 8 mm (range

TABLE 1. Summaries of patient demographic data

Total no. patients	27
Sex (male/female)	16/9
Median age (y)	74 (range 18-88)
GUs/DUs	8/19
Median size of ulcers (mm)	8 (range 2-20)
Forrest status: Ia/Ib/IIa	12/2/12
No. patients on aspirin	5
Hb level before endoscopy (g/dL)	9.6 (range 6.5-12.7)
Hb level after endoscopy (g/dL)	10 (range 8.2-12.0)

Ia, Ulcer with spurter; Ib, ulcer with active oozing; IIa, ulcer with thrombosed vessel seen.

TABLE 2. Summaries of endoscopic results after the use of TriClips

Median procedure time (min)	10 (range 3-30)
Rate of successful hemostasis by TriClips alone in the first EGD (%)	81.5 (22/27)
Clinical recurrent bleeding rate after the first EGD (%)	0 (0/27)
Endoscopic recurrent bleeding rate in a second EGD (%)	14.8 (4/27)
Permanent hemostatic rate (%)	66.7 (18/27)
Clips dislodgement rate revealed in a second EGD (%)	40.7 (11/27)
Positive <i>H pylori</i> status (%)	55.6 (15/27)
Ulcer healing (%)	100 (27/27)

TABLE 3. Characteristics of patients who failed to be treated by TriClips alone in the first EGD

Patient no.	1	2	3	4	5
Site of ulcer/size (cm)	DU/2	GU/1.2	GU/1.5	DU/1.0	GU/1.0
Forrest classification	Ila	Ib	Ib	Ia	IIa
Procedure time (min)	15	17	18	14	17
No. TriClips used	1	1	2	1	2
Reasons for failure	Tangential position	Fibrotic ulcer	Fibrotic ulcer	Tangential position	Fibrotic ulcer
2nd EGD findings	TriClip dislodged	TriClip dislodged	TriClip dislodged	TriClip dislodged	TriClip in situ
RUT for <i>H pylori</i>	Negative	Negative	Negative	Negative	Negative
Histology for <i>H pylori</i>	Absent	Absent	Absent	Present	Absent

2-20 mm). Successful hemostasis with a TriClip alone on the first endoscopy was achieved in 22 cases (81.5%), whereas the remaining 5 patients (3 GU and 2 DU) needed additional epinephrine injection and heat probe application for complete homeostasis. Among these 5 patients, 1 had Forrest Ia ulcers, 2 had Ib ulcers, and the remaining 2 patients had IIa ulcers. Their median ulcer size was 13.4 mm (range 10-20 mm). Only 1 of the patients was *H pylori* positive.

No patient required emergency re-endoscopy because of clinical evidence of recurrent bleeding within the first 24 hours. All 27 cases underwent a check endoscopy performed 24 hours after the initial treatment. Four patients (14.8%) had endoscopic evidence of recurrent bleeding; all were slow oozing from the previously treated ulcer site: 3 of the patients had Forrest Ia ulcers, whereas the remaining patient had Forrest IIa ulcers, and all were DU cases. Their median size of ulcers was 8 mm (range 5-10 mm). Three were *H pylori* positive. These 4 patients

required epinephrine injection and heat probe application for complete hemostasis.

TriClips were found dislodged within 24 hours in 11 patients (40.7%), 4 GU cases, and 7 DU cases. There was no major morbidity or mortality detected in all cases. Fifteen patients were *H pylori* positive, either from a RUT test or revealed on histology, and they were given standard triple therapy regimen for eradication. No malignancies were detected, and all patients had their ulcers healed in 8 weeks' time. Instrument failure was not encountered during the study period.

DISCUSSION

Various methods and techniques are now available for the endoscopic management of peptic ulcer hemorrhage. Among these, mechanical hemostasis by means of

hemoclips has the advantage of minimal tissue trauma. However, the technical and practical limitations of a hemoclip often hinders its use, making it less popular.

In an experimental study, Maiss et al¹⁵ found that the TriClip was comparable with another hemoclip (HX-200L-135; Olympus, Tokyo, Japan) in their hemostatic efficacy. Jensen et al,¹² in their animal study of 3 different kinds of hemoclips for hemostasis of acute ulcers, also found that TriClips are comparable with other hemoclips, with initial successful hemostasis of 100%. However, these results have never been confirmed in human beings. It was not until recently that Lin et al¹⁴ found that TriClips are actually inferior to the hemoclip (HX-600-135, HX-5LR-1; Olympus) in obtaining primary hemostasis in patients with high-risk peptic ulcer (76% vs 94%). In addition, they found that a hemoclip was more ideal than the TriClip in dealing with bleeders that were located in difficult-to-approach sites.

In the present pilot study, the TriClip alone can achieve primary hemostasis in more than 80% of cases in the first endoscopy; the overall hemostatic rate was 66.7%. Five patients required additional adrenaline injection for complete hemostasis (Table 3). These 5 patients had either a larger ulcer or fibrotic base or had an ulcer in a tangential position, although there were no obvious relations between different Forrest statuses. Perhaps this device was not particularly good in tackling large bleeding ulcers. Furthermore, the clip dislodgement rate of 40.7% in the present study was unacceptably high: 11 patients lost their clips within 24 hours. The far-from-ideal hemostatic rate and clips dislodgment rate may be accounted for by the presence of a relatively large number of DUs in the present study.^{15,16} It is well known that DUs were less amenable to clipping because of their relative tangential position in most situations. The advantages of the easier centering of a bleeding site by the 3-prong design of the clips will be lost if further clips are needed. The additional clips must circle just beside the clip, and a second or third clip application could be more challenging. These factors may well influence the overall efficacy of this new device.

Although the median number of clips used in the present study was low compared with other studies, it does not account for the lower overall hemostatic rate of TriClips, because we set no limit to the number of TriClips used to arrest bleeding. The low number of clips used in the present study may be because of the relatively small size of the ulcers; only 4 cases have ulcer size greater than 10 mm.

The endoscopic recurrent bleeding rate of 14.8% (4 cases) was comparable with other studies of hemoclips in the literature but better than the TriClip study by Lin et al¹⁴ (28.9%). In fact, 3 of the 4 patients who experienced recurrent bleeding have Forrest Ia ulcers, which were prone to recurrent bleeding anyway.^{17,18} It has been shown that, after endoscopic treatment of bleeding ulcers, high-dose continued infusion of omeprazole (bolus

intravenous injection of 80 mg followed by an infusion of 8 mg per hour for 72 hours) significantly reduced the risk of recurrent bleeding. Perhaps the adoption of this regimen might further improve the overall hemostatic rate in the present study.¹⁹ In accordance with other clipping devices and the animal study of TriClips by Jensen et al,¹² the TriClip had no obvious negative effect on ulcer healing, because all ulcers healed at 8 weeks' time.

In conclusion, the use of the TriClip is feasible in the initial control of upper-GI bleeding, with an acceptable procedure time. However, we could not detect any obvious advantages in arresting bleeding vessels when using the TriClip. Further controlled studies should be carried out for the evaluation of this new clipping device.

DISCLOSURE

The authors report that there are no disclosures relevant to this publication.

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