Abstract: Endoclip is currently the preferred tool for endoscopic hemostasis in many endoscopic units. But, due to some technical limitations of endoclip and success of hemostatic forceps in hemostasis during endoscopic submucosal dissection (ESD), we aimed to study the efficiency and safety of hemostatic forceps in treating various causes of gastrointestinal (GI) bleeding. Retrospectively, we reviewed the files of patients treated in Al-ahsa hospital endoscopy unit during the period from 1 January 2018 to 30 November 2018. We enrolled 33 patients with GI bleeding that necessitate endoscopic treatment. During hemostatic forceps use, the blood was washed out using a water-jet-equipped, single-channel gastroscope. The bleeding points were pinched and gently retracted with hemostatic forceps. Monopolar electrocoagulation was performed using an electrosurgical current generator. Three patients suffered from post-sphincterotomy bleeding that treated initially with hemostatic forceps with 100% primary hemostasis without complications. Fifteen patients were treated with endoclipping with 100% primary hemostasis and two patients (13%) had rebleeding. The procedure duration was 8.53 ± 3.58 min. Hemostatic forceps was used as a primary tool for hemostasis in another 15 patients with achieved hemostasis in all patients without any subsequent complications. The procedure duration was 5.27 ± 2.05 min (P = 0.005). In conclusion,
hemostatic forceps can be an effective, fast, as well as safe alternative approach for GI bleeding of various origins.

**Subjects**: Health & Society; Health Conditions; Public Health Policy and Practice; Medicine

**Keywords**: GI bleeding; hemostatic forceps; coagrasper; endoclip; hemoclip; endoscopic hemostasis

1. **Introduction**
Therapeutic endoscopy is the first line of treatment in GI bleeding as it is associated with decreased recurrent bleeding, surgery and mortality (Cook et al., 1992). Since the appearance of endoclip gastroenterologists started to use it to mark gastric lesion few decades ago (Hachisu, Miyazaki, & Hamaguchi, 1989). After refinement of the design of the endoclip, it was used as a primary tool for endoscopic hemostasis in many endoscopy units (Jensen, Machicado, & Hirabayashi, 2009). Hemostatic forceps was used successfully in inducing hemostasis during ESD (Enomoto et al., 2007). Hemostatic forceps have been tried for endoscopic treatment of bleeding gastric ulcer (Enomoto, Yahagi, & Fujishiro et al., 2004).

But endoclipping needs highly skilled endoscopist and assistant who work in harmony. Any movement as intestinal peristalsis may interfere with the precise catch, in the correct angle, of bleeder. Potential tissue damage or cut with delicate tissue may occur. Less effective in fibrotic or hard tissue such as chronic or malignant ulcers. Dislodgement either spontaneously or following subsequent endoclip placement can happen. Kinks or looping of the endoclip device, as in lesions located in the gastric cardia and lesser curvature and posterior wall of duodenum, will interfere with proper endoclip placement (Bhatti, Amoateng-Adjepong, Qamar, Matlock, & Loyd, 1998; Cappell, 2005; Kovacs, 2008; Rudolph, Landsverk, & Freeman, 2003). To the best of our knowledge, none studied the use of hemostatic forceps in treatment of various causes of GI bleeding, outside its use in ESD, in our area: Saudi Arabia, Egypt and even in the Middle East.

So, we performed this study to determine the efficiency and safety of hemostatic forceps in various GI bleeding causes.

2. **Patients and methods**
From 1 January 2018 to 30 November 2018, we enrolled 33 patients (22 men and 11 women) who required endoscopic hemostasis for GI bleeding and aged more than 18 years. Endoscopic examination was done at Al-ahsa hospital endoscopy unit, Al-ahsa, Eastern Province, Kingdom of Saudi Arabia. All procedures were done by the same endoscopist. This is retrospective cohort study that was approved by the institutional ethical review committees of Al-ahsa hospital. Written informed consent was obtained from all patients before endoscopic examination. Three patients with post-sphincterotomy bleeding were totally assigned to hemostatic forceps treatment. Fifteen out of the 30 patients were assigned to endoclipping (Group I), and the remaining 15 patients were treated with hemostatic forceps (group II). The choice of endoscopic therapy was decided by the endoscopist depending on the feasibility of use of either technique in specified patient. The groups were compared regarding initial hemostasis, the period spent till hemostasis was achieved and rebleeding rate. Time required to achieve hemostasis (measured from the point of time at which the decision was made to start of the procedure till hemostasis or change of decision). Rebleeding was defined as overt GI bleeding, shock and/or decrease in the hemoglobin level of greater than 2 g/dl during a 24-h period after the initial stabilization of pulse, blood pressure, and hemoglobin level. When rebleeding was suspected, endoscopic hemostasis was immediately performed.

For patients in Group II, we used a hemostatic forceps (Coagrasper, FD-410LR or FD-411UR; Olympus medical systems corp., Tokyo, Japan). The blood was washed out using a water-jet-equipped, single-channel gastroscope (GIF-H170; Olympus medical systems corp., Tokyo, Japan), with a 2.8 mm working channel. The bleeding point was grasped and gently retracted with the
hemostatic forceps. At that point, Monopolar electrocoagulation was delivered using an electrosurgical current generator (PSD 30; Olympus medical systems corp., Tokyo, Japan) with soft or rarely forced mode at a setting of 40–50 W. For patients in Group I, hemoclips (Safeclip® U2525-230; G-FLEX® Co. Ltd., Nivelles, Belgium) were used.

The collected data were organized and tabulated and statistically analyzed using SPSS for Windows version 22.0. Statistical analysis was performed using chi-square, including Fisher’s exact, test for categorical data and t-test for scale data. P value <0.05 was considered to indicate a significance.

3. The results
This study included 33 (22 males and 11 females) patients with various causes of GI bleeding who met the inclusion criteria. Three of them with post-sphincterotomy bleeding were assigned to treatment with hemostatic forceps. All of them were males and aged 25, 47 and 53 years. For all of them, initial hemostasis was achieved without rebleeding. The time needed for hemostasis ranged from 3 to 8 min. The characteristics of the remaining 30 patients are shown in Table 1. There was no significant statistical difference between the two groups.

The lesions site and Forrest class are outlined in Table 2. Group I included five gastric and five duodenal ulcers beside three rectal ulcers and two post-polypectomy lesions. Group II consisted of six gastric lesions: two of them were cancer and four were ulcers. Two of these ulcers were located near the cardia and the others were at the posterior wall of the antrum. All the duodenal lesions were ulcers: three of them were large and contained big vessels and the others were in the posterior wall. The remaining three lesions were at the colon and all of them were behind folds.

Initial hemostasis was achieved in all patients of both groups. Rebleeding occurred in two patients of group I but the difference was not statistically significant. The use of hemostatic forceps was faster than the endoclip application and that was statistically significant (Table 3).

4. Discussion
We found that hemostatic forceps can induce 100% initial hemostasis of various GI bleeding causes. No rebleeding occurred with hemostatic forceps, and the procedure was faster than endoclipping. So it may be highly promising tool for treating various causes of GI bleeding. This efficiency and safety may be due to its 1) easy manipulation: can be used in difficult situations for the endoclip to be applied, 2) precise grasp of the bleeder, 3) use with closed jaws to induce coagulation, 4) rarity to cause complications as perforation. We noticed some drawbacks during the use of hemostatic forceps such as 1) delay of coagulation, 2) limited opening and closing mobility range, 3) the need to change the mode to get effective coagulation: into forced coagulation mode.

This study also showed that the endoclip can result in 100% initial hemostasis. Rebleeding occurred in about 13.3%. The procedure of its application took longer time than that of the

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Table 1. The demographic characteristics of the patients

|                      | Group I (n = 15) | Group II (n = 15) | P value |
|----------------------|-----------------|------------------|---------|
| Mean age in years    | 46.13 ± 13.37   | 52.20 ± 10.71    | 0.18    |
| age (range)          | (24.0–75.0)     | (33.0–66.0)      |         |
| Sex (males)          | 10.0            | 9.0              | 0.70    |
| NSAIDs (use)         | 7.0             | 9.0              | 0.46    |
| ASA class (P1/P2/P3) | 8/5/2           | 6/8/1            | 0.52    |
| Smoking (yes)        | 7.0             | 5.0              | 0.46    |
| History of peptic ulcer (yes) | 6.0          | 5.0              | 0.71    |
hemostatic forceps. This can be explained by the need for skilled manipulation, movements as intestinal peristalsis may interfere with the precise grasp of bleeder, tissue damage with delicate tissue, less efficacy in fibrotic or hard tissue as chronic or malignant ulcers, and dislodgement either spontaneously or following subsequent endoclip placement.

To the best of our knowledge, this report is the first one, about use of hemostatic forceps outside its use in ESD, in our area: Saudi Arabia, Egypt and even in the Middle East.

Kataoka, Kawai, Hayama, and Fenton-Lee (2013) studied some esophageal and gastroduodenal bleeding lesions and reported, in agreement with our results, 100% and 78% initial hemostasis for hemostatic forceps and endoclip, respectively. Rebleeding occurred in 3.7% and 22.2%, respectively. They also showed that hemostatic forceps is faster (in minutes) than the endoclip (6.8 ± 13.4 and 15.4 ± 17.0, respectively).

Toka, Eminler, and Karacaoer et al. (2018) demonstrated initial hemostasis success rate, in treating bleeding peptic ulcer, of 98.2% and 80.4% in hemostatic forceps and endoclip groups, respectively. Rebleeding was recorded in 3.7% and 22.2%, respectively. They also showed that hemostatic forceps is faster (in minutes) than the endoclip (6.8 ± 13.4 and 15.4 ± 17.0, respectively).

Arima et al. (2010) treated 96 patients with gastric ulcers and described successful initial hemostasis in 85% of the hemostatic forceps group and 79% of the endoclip group, respectively. Rebleeding accounted in 2% and 10%, respectively. Also, he displayed a shorter duration of hemostatic forceps procedure (9.2 ± 11.1 vs. 13.6 ± 9.4 min.).

The rebleeding rate, in bleeding gastric ulcers, was 3.6% in hemostatic forceps group and 8.3% in endoclip group, respectively (Arima et al., 2010).

The differences in these reports may be due to small number of patients in our study, variable sites of the lesions in our group of patients, non-randomization of our patients, and the selection bias, but this is the nature of real-life studies, and endoscopy unit team experience. All of the reports including our study did not mention any stratification of their patients according to any of the well-known systems for GI bleeding.
Some of the advantages of this study include that the data are from real life, all cases were done by one endoscopist and the new tool tried in other lesions than gastroduodenal ulcers.

In conclusion, this study shows that the hemostatic forceps is efficient, fast and safe procedure and can be tried in treating various causes of GI bleeding. More studies on larger number of patients are needed to confirm and validate these results and establish the proper technique, proper mode of coagulation and power settings, according to the site and nature of the lesion, to avoid any possible complications.

Funding
The author received no direct funding for this research.

Competing interests
The author declares no potential conflict of interests.

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Citation information
Cite this article as: Hemostatic forceps in various gastrointestinal bleeding scenarios: A single center comparative study with endoclip, Mohamad Abdelaziz, Cogent Medicine (2019), 6: 1623000.

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