



Original article

Comparison of heater probe coagulation and argon plasma coagulation in the management of Mallory–Weiss tears and high-risk ulcer bleeding



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ABSTRACT

Background and study aims: Upper gastrointestinal (GI) bleeding is a common medical emergency. Endoscopic treatments often lead to better therapeutic outcomes than conventional conservative treatments. This study aimed to investigate and compare the use of heater probe coagulation (HPC) and argon plasma coagulation (APC) together with epinephrine injection for the treatment of Mallory–Weiss tears and high-risk ulcer bleeding.

Patients and methods: A total of 97 patients (54 in the HPC group and 43 in the APC group) who were diagnosed with upper GI bleeding secondary to a Mallory–Weiss tear or high-risk gastric or duodenal ulcers were included in the study. Lesions were classified according to the Forrest classification. The HPC and APC groups were compared in terms of initial haemostasis, re-bleeding in the early period, need for surgery, average need for transfusion, and duration of hospital stay.

Results: There were no significant differences between the HPC and APC groups in terms of ensuring initial haemostasis (98% vs. 97.5%, $p > 0.05$), re-bleeding rates (17% vs. 19%, $p > 0.05$), need for surgery (2% vs. 9%, $p > 0.05$), average need for transfusion (3.7 ± 2.11 vs. 3.4 ± 2.95 units, $p > 0.05$), and average duration of hospital stay (4.6 ± 2.24 vs. 5.3 ± 3.23 days, $p > 0.05$).

Conclusion: There was no difference between HPC and APC when used together with epinephrine injection for the treatment of Mallory–Weiss tear and high-risk ulcer bleeding.

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Introduction

Upper gastrointestinal (GI) bleeding is defined as bleeding resulting from haemorrhages proximal to the Treitz ligament. The most frequent aetiologies in non-variceal upper-GI bleeding are peptic ulcers, erosions, and Mallory–Weiss tears. In most patients, the bleeding stops spontaneously, which generally indicates good prognosis [1]. However, re-bleeding in high-risk lesions may require surgical treatment. It has been shown that endoscopic treatments such as injection of sclerosing agents, thermal coagulation through heater probe coagulation (HPC) or argon plasma coagulation (APC), and haemoclip applications significantly reduce the rates of recurrent bleeding, need for surgery, and mortality when compared to conventional treatment; therefore, their standard use is suggested [2–5]. Although there are many published studies comparing endoscopic monotherapy and dual therapy, there are a few studies comparing the effectiveness of HPC and APC.

In the current study, we aimed to compare the effectiveness of HPC and APC when used together with epinephrine injection for the endoscopic treatment of patients who were diagnosed with upper GI bleeding secondary to a Mallory–Weiss tear and/or a high-risk gastric or duodenal ulcer.

Patients and methods

Patient selection

We retrospectively examined the records of patients (>18 years of age) who were monitored for upper GI bleeding and who were treated with HPC or APC together with epinephrine injection at the Department of Gastroenterology, Akdeniz University, between September 2012 and September 2015. Patients diagnosed with vascular malformation, gastric antral vascular ectasia, and malignant lesions were not included in the study. Consequently, 97 patients who were diagnosed with Mallory–Weiss tear and high-risk gastric or duodenal ulcer patients were included in the study. Lesions were classified as spurting haemorrhage, oozing

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haemorrhage, non-bleeding visible vessel, or adherent clot according to the Forrest classification. Patients who underwent HPC or APC were compared in terms of ensuring initial haemostasis, re-bleeding in the early period, need for surgery, average need for transfusion, and duration of hospital stay. Early re-bleeding was defined as the need for re-endoscopy and repeated interventions due to findings of active bleeding during the hospital stay.

Endoscopy and treatment procedures

Endoscopy was performed with a Fujinon EG-530 WR (Tokyo, Japan) gastroscopy device. The HPC operation was performed using 10F probes with an Olympus HPU-20 brand device, and the APC process was performed with an Erbe VIO 200 S brand device with the power/gas flow adjustment at 50 W and 1.8 L/min. Each patient was given a diluted epinephrine (1/10000) injection around the lesion prior to HPC or APC. All patients were monitored with a similar medical treatment protocol after undergoing endoscopy (intravenous pantoprazole [40 mg, twice/day] followed by oral pantoprazole).

Statistical analysis

Statistical analyses were performed using SPSS software version 16.0 (Chicago, IL, United States). The chi-square test and the two independent samples *t*-test were used to compare patient characteristics. Values of *p* < 0.05 were considered to be statistically significant.

Results

Fifty-four of the patients included in the study underwent HPC and 43 underwent APC. Females were more dominant in the APC group; however, there were no other differences between the two groups in terms of average age, presence of comorbidities (having one or more diseases such as coronary artery disease, diabetes mellitus, hypertension, chronic renal failure, non-GI malignancy, and cerebrovascular accident), and the use of antiplatelets (e.g., acetylsalicylic acid or clopidogrel) and/or anticoagulants (*p* > 0.05). Patient demographic data are shown in Table 1. There were no differences between the groups in terms of endoscopic diagnosis and lesion classification (*p* > 0.05) (Table 2). Further, there were no significant differences between the two groups in terms of ensuring initial hemostasis, re-bleeding in the early period, need for re-endoscopy, need for surgical treatment, average

Table 2

Distribution of the patients who underwent HPC and APC according to the diagnosis and classification of the lesion.

	HPC (n = 54)	APC (n = 43)	P value
Diagnosis (n)			
Mallory-Weiss	5	4	0.98
Gastric ulcer	19	15	
Duodenum ulcer	30	24	
Classification (n)			
Spurting hemorrhage	4	2	0.65
Oozing hemorrhage	15	17	
Non-bleeding visible vessel	23	16	
Adherent clot	12	8	

HPC: Heater probe coagulation; APC: Argon plasma coagulation.

need for transfusion, and duration of hospital stay (*p* > 0.05) (Table 3). No complications were observed in the APC or HPC groups with regard to the procedure. However, a hemoclip was applied to one patient in the HPC group because that patient could not reach initial hemostasis. Further, a 75-year-old female patient in the HPC group passed away; she had suffered from cerebrovascular accident, coronary artery disease, and hypertension. Urgent surgical treatment was provided to a patient in the APC group due to a spurting bleeding duodenal ulcer, because initial haemostasis could not be ensured; this patient passed away due to sepsis during the follow-up period after the operation. Table 4 lists cases with recurrent bleeding and need for surgery according to their diagnosis and classification of lesions.

Discussion

Upper GI lesions which actively bleed or have high-risk bleeding indicators are good candidates for endoscopic treatment, which is quite effective for the control of active bleeding and reducing bleeding recurrence, need for surgery, and mortality [2–4]. Several studies have shown that in endoscopic treatment, the use of thermal coagulation and mechanical treatment together with epinephrine injection is more effective than epinephrine injection alone [6,7]. In contrast, a meta-analysis by Marmo et al. that studied the effectiveness of endoscopic dual therapy and monotherapy in high-risk bleeding ulcers reported that the combined treatment provided no benefit over thermal coagulation or mechanical treatment alone [8]. The European Society of Gastrointestinal Endoscopy recently issued new guidelines for the diagnosis and

Table 1

Demographic data of the patients who underwent HPC and APC.

	HPC (n = 54)	APC (n = 43)	P value
Age, years (avg ± SD)	61.7 ± 18.3	56.8 ± 20.4	0.22
Gender (n)			
Male	34	37	0.01
Female	20	6	
Comorbidity (n)			
Yes	32	28	0.55
No	22	15	
Medication (n)			
Nonsteroidal anti-inflammatory drugs	12	6	0.8
Antiaggregant	11	12	
Anticoagulant	5	4	
Antiaggregant + anticoagulant	1	0	
None	25	21	

HPC: Heater probe coagulation; APC: Argon plasma coagulation; avg: Average; SD: Standard deviation.

Table 3

Comparison of the groups by initial hemostasis, recurrent bleeding, need for surgery, average need for transfusion, and duration of hospital stay.

	HPC (n = 54)	APC (n = 43)	P value
Initial hemostasis (n,%)			
Yes	53 (98%)	42 (97.5%)	0.7
No	1 (2%)	1 (2.5%)	
Recurrent bleeding (n,%)			
Yes	9 (17%)	8 (19%)	0.8
No	45 (83%)	35 (81%)	
Need for surgical treatment (n,%)			
Yes	1 (2%)	4 (9%)	0.099
No	53 (98%)	39 (91%)	
Need for transfusion, unit (avg ± SD)	3.7 ± 2.11	3.4 ± 2.95	0.62
Duration of hospitalization, day (avg ± SD)	4.6 ± 2.24	5.3 ± 3.23	0.21

HPC: Heater probe coagulation; APC: Argon plasma coagulation; avg: Average; SD: Standard deviation.

Table 4

Cases with recurrent bleeding and need for surgery according to the diagnosis and classification of lesion.

	Recurrent bleeding (n = 17)	Need for surgery (n = 5)
HPC group		
Gastric ulcer		
Spurting hemorrhage	1	1
Oozing hemorrhage	1	
Non-bleeding visible vessel	3	
Duodenum ulcer		
Spurting hemorrhage	1	
Oozing hemorrhage	1	
Non-bleeding visible vessel	2	
APC group		
Gastric ulcer		
Spurting hemorrhage	–	
Oozing hemorrhage	2	
Non-bleeding visible vessel	2	1
Duodenum ulcer		
Spurting hemorrhage	2	2
Oozing hemorrhage	–	
Non-bleeding visible vessel	2	1

HPC: Heater probe coagulation; APC: Argon plasma coagulation.

treatment of non-variceal upper GI bleeding; these guidelines suggest the use of a secondary haemostatic method (thermal, mechanical, or the injection of a sclerosing agent) in combination with an injection of diluted epinephrine for spurting and oozing-type actively bleeding lesions. These guidelines also suggest that thermal or mechanical methods or the injection of a sclerosing agent can be applied alone or in combination with epinephrine injections in lesions with non-bleeding visible vessels [5]. In our current study, all the patients underwent combined treatment with HPC or APC plus epinephrine injection.

The HPC method utilizes thermal probes to compress bleeding lesions. This method carries the risk of deep penetration or perforation due to contact with the tissue. The APC method is known to be effective in ulcer bleeding; this method forms coagulation necrosis in tissues by applying a high-frequency electric current while emitting argon gas to the target tissue in pressurized form [9–12]. Although there are many published studies comparing monotherapy and dual therapy for the treatment of upper GI bleeding, there are few studies comparing the effectiveness of HPC and APC.

Cipolletta et al. compared the effectiveness of HPC and APC in treating peptic ulcer bleeding in 41 patients. They found no differences between the HPC and APC groups in terms of hemostasis (95% vs. 92%), recurrent bleeding (21% vs. 15%), urgent surgical need (15% vs. 9.5%), and 30-day mortality (5% vs. 4.5%); however, they noted that APC ensures significantly quicker hemostasis (mean 60 ± 19 vs. 115 ± 28 s, $p < 0.05$) [13]. A prospective randomized controlled study by Chau et al. compared the effectiveness of HPC or APC together with epinephrine injection in 185 patients with high-risk ulcer bleeding. These authors also found no differences between the HPC and APC groups in terms of ensuring initial hemostasis (95.9% vs. 97.7%), frequency of recurrent bleeding (21.6% vs. 17.0%), urgent surgical need (9.3% vs. 4.5%), average duration of hospital stay (8.2 vs. 7.0 days), and average need for transfusion (2.4 vs. 1.7 units). This study also reported that there were no significant differences between the two groups in terms of endoscopic findings of patients in whom an endoscopic control was applied in the eighth week [14]. The prospective randomized study by Karaman et al. included a similar patient population, and aimed to compare the effects of HPC and APC together with epinephrine injection on ensuring hemostasis and preventing re-bleeding. Unlike the other studies, Karaman et al. reported that

APC was significantly more effective in ensuring initial hemostasis than HPC (97.7% vs. 81%, $p < 0.05$). However, the rates of bleeding in the first 4 weeks following the procedure were similar in the HPC and APC groups [15].

Both HPC and APC were also reported to be effective for the treatment of Mallory–Weiss tears [16]. Thus, patients with Mallory–Weiss tears were also included in our current study, although they were few in number. No difference was found between the HPC and APC treatment in these patients.

Previous studies have defined recurrence as repeated bleeding in the first 30 days following the procedure. In our current study, we defined early recurrence as repeated bleeding during the hospital stay after initial hemostasis was ensured. Our data revealed no significant differences between HPC and APC in terms of initial hemostasis, re-bleeding in the early period, average need for transfusion, and average duration of hospital stay. While the number of the patients in the APC group who needed surgical treatment was higher than that of the HPC group, this difference was not statistically significant.

One limitation of our study is its retrospective nature. However, to ensure availability of complete data, those patients with missing data were not included in the study. Another limitation is that the procedures were performed by different endoscopists. However, the endoscopists included in this study had at least 2 years of experience, and standard definitions were used in the diagnosis and classification of the lesions.

In conclusion, on the basis of a review of the literature and the findings of our current study, HPC and APC are similarly effective when used together with epinephrine injection for the endoscopic treatment of upper GI bleeding secondary to Mallory–Weiss tears and high-risk gastric or duodenal ulcers.

Conflict of interest

The authors declared that there is no conflict of interest.

References

- [1] Rockall TA, Logan RF, Devlin HB, Northfield TC. Incidence of and mortality from acute upper gastrointestinal haemorrhage in the United Kingdom. Steering Committee and members of the National Audit of Acute Upper Gastrointestinal Haemorrhage. *BMJ* 1995;311(6999):222–6.
- [2] Cook DJ, Guyatt GH, Salena BJ, Laine LA. Endoscopic therapy for acute nonvariceal upper gastrointestinal hemorrhage: a meta-analysis. *Gastroenterology* 1992;102:139–48.
- [3] Savides TJ, Jensen DM. Therapeutic endoscopy for nonvariceal gastrointestinal bleeding. *Gastroenterol Clin North Am* 2000;29:465–87.
- [4] Sung JJ, Chan FK, Lau JY, Yung MY, Leung WK, Wu JC, et al. The effect of endoscopic therapy in patients receiving omeprazole for bleeding ulcers with nonbleeding visible vessels or adherent clots: a randomized comparison. *Ann Intern Med* 2003;139:237–43.
- [5] Gralnek IM, Dumonceau JM, Kuipers EJ, Lanas A, Sanders DS, Kurien M, et al. Diagnosis and management of nonvariceal upper gastrointestinal hemorrhage: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. *Endoscopy* 2015;47(10):a1–a46.
- [6] Vergara M, Bennett C, Calvet X, Gisbert JP. Epinephrine injection versus epinephrine injection and a second endoscopic method in high-risk bleeding ulcers. *Cochrane Database Syst Rev* 2014 Oct 13;10:CD005584.
- [7] Calvet X, Vergara M, Brullet E, Gisbert JP, Campo R. Addition of a second endoscopic treatment following epinephrine injection improves outcome in high-risk bleeding ulcers. *Gastroenterology* 2004;126(2):441–50.
- [8] Marmo R, Rotondano G, Piscopo R, Bianco MA, D'Angella R, Cipolletta L. Dual therapy versus monotherapy in the endoscopic treatment of high-risk bleeding ulcers: a meta-analysis of controlled trials. *Am J Gastroenterol* 2007;102(2):279–89.
- [9] Freeman ML. New and old methods for endoscopic control of nonvariceal upper gastrointestinal bleeding. *Rev Gastroenterol Mex* 2003;68(Suppl 3):62–5.
- [10] Vargo JJ. Clinical applications of the argon plasma coagulator. *Gastrointest Endosc* 2004;59:81–8.
- [11] Cappell MS, Friedel D. Acute nonvariceal upper gastrointestinal bleeding: endoscopic diagnosis and therapy. *Med Clin North Am* 2008;92(3):511–50.
- [12] Wang HM, Tsai WL, Yu HC, Chan HH, Chen WC, Lin KH, et al. Improvement of short-term outcomes for high-risk bleeding peptic ulcers with addition of

- argon plasma coagulation following endoscopic injection therapy: a randomized controlled trial. *Med (Baltimore)* 2015;94(32):e1343.
- [13] Cipolletta L, Bianco MA, Rotondano G, Piscopo R, Prisco A, Garofano ML. Prospective comparison of argon plasma coagulator and heater probe in the endoscopic treatment of major peptic ulcer bleeding. *Gastrointest Endosc* 1998;48(2):191–5.
- [14] Chau CH, Siu WT, Law BK, Tang CN, Kwok SY, Luk YW, et al. Randomized controlled trial comparing epinephrine injection plus heat probe coagulation versus epinephrine injection plus argon plasma coagulation for bleeding peptic ulcers. *Gastrointest Endosc* 2003;57(4):455–61.
- [15] Karaman A, Baskol M, Gursoy S, Torun E, Yurci A, Ozel BD, et al. Epinephrine plus argon plasma or heater probe coagulation in ulcer bleeding. *World J Gastroenterol* 2011;17(36):4109–12.
- [16] Kim HS. Endoscopic management of Mallory-Weiss tearing. *Clin Endosc* 2015;48(2):102–5.