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Application of endoscopic hemoclips for nonvariceal upper gastrointestinal bleeding in children

STOMACH

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Original Article

ABSTRACT

Background/Aims: Data about the efficiency and outcome of therapeutic endoscopic techniques in children with nonvariceal upper gastrointestinal bleeding (UGB) are scarce. We aimed to analyze our experience with endoscopic hemoclip application in children with non-variceal UGB.

Materials and Methods: During a 3-year period, a total of 1715 endoscopies were performed in our pediatric endoscopy unit; 182 (10.6%) of them were performed for UGB to 158 patients. Fifty-six of them had emergent endoscopy. Among them, 15 cases with nonvariceal UGB were only given endoscopic hemoclips. Demographic, clinical, and laboratory findings at initial admission; endoscopic appearance of bleeding lesions; and outcome of hemoclip application were recorded from the hospital files and endoscopy records.

Results: Ten patients (66.6%) had gastric ulcer, 3 (20%) had duodenal ulcer, 1 (6.7%) had Dieulafoy lesion, and 1 (6.7%) had bleeding at the post-polypectomy site. Initial homeostasis after hemoclip application was achieved in all patients (100%). Rebleeding was seen in only one patient (6.5%) with a Dieulafoy lesion, who needed hemoclip application for a second time, and the bleeding was controlled successfully. Permanent hemostasis was 100%. The median number of hemoclips used per case and per application was 3.4 and 3.2, respectively. None of the patients experienced any complication related to hemoclip application. Median duration of hospitalization was 6 days. On follow-up, none of the patients received surgical therapy, and 30-d mortality related to bleeding was 0%.

Conclusion: The use of hemoclips for nonvariceal UGB in children is an effective modality to control bleeding without any complications in children.

Keywords: Hemoclips, nonvariceal bleeding, children

INTRODUCTION

Upper gastrointestinal bleeding (UGB) is an uncommon but potentially serious problem in children. It constitutes 10%-15% of all admissions to pediatric gastroenterologists (1). Additionally, 6% to 25% of children in the intensive care units have some form of UGB during hospitalization (2,3). The clinical presentation ranges from asymptomatic microcytic anemia to hypovolemic shock. The etiology varies with age but can be broadly divided into two main groups: variceal (chronic liver disease and extrahepatic portal vein obstruction) and nonvariceal (ulcers, erosions, and vascular malformations) (4). Early diagnosis and treatment of UGB are essential, especially in patients with active bleeding, because late intervention is associated with increased morbidity, mortality, and economic cost.

The aim of therapy in a child with gastrointestinal bleeding should involve hemodynamic resuscitation, cessation of bleeding from the source, and prevention of future episodes of gastrointestinal bleeding (4,5). Endoscopic evaluation remains the most rapid and accurate method not only for identification of the origin of bleeding but also for the therapeutic management.

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Reducing the pressure in the esophageal and gastric varices by reducing portal pressure is the mainstay of variceal bleeding (6). This can be accomplished by medical agents (vasopressin and octreotide) and endoscopic band ligation or sclerotherapy (4-6). Medical agents (proton pump inhibitors or antacids) are appropriate for most nonvariceal UGB cases, but endoscopic management is needed in some cases, especially with active bleeding or patients with high-risk stigmata for rebleeding. Injection, coagulation/thermal therapy, laser therapy, and hemoclip application are the most commonly used endoscopic techniques for nonvariceal UGB (7). The usage of these techniques depends on equipment availability and experience of the endoscopists. Data on the efficiency and outcome of these therapeutic endoscopic techniques in children with nonvariceal UGB are scarce. Therefore, we aimed to analyze our experience with endoscopic hemoclip application in children with nonvariceal UGB.

MATERIALS AND METHODS

During a 3-year period, a total of 1715 upper gastrointestinal system endoscopies were performed in our pediatric endoscopy unit; 182 (10.6%) of them were for UGB in 158 patients (Table 1). Fifty-six of them were emergent endoscopies. Sixteen of them were performed for variceal bleeding; 8 were band ligation, and 8 were sclerotherapy. Forty of them were performed for nonvariceal UGB; 9 were adrenalin injection; and 15 (7 F, 8 M; median 12 years, range 3-15 years) were endoscopic hemoclips; and 9 were both adrenalin injection and hemoclip application. The rest of the patients did not receive any therapeutic endoscopic management.

Demographic, clinical, and laboratory findings at initial admission, endoscopic appearance of bleeding lesions, and outcomes of hemoclip application were recorded from the hospital files and endoscopy records. Hemorrhagic activity of the ulcer was classified according to Forrest classification (8). Forrest classification is a classification of UGB used for the purposes of comparison and in selecting patients for endoscopic treatment. Forrest 1 includes acute hemorrhage (1a spurting, 1b oozing), 2 includes recent hemorrhage (2a visible vessels, 2b adherent clot, and 2c hematin on ulcer base), and 3 includes lesions without active bleeding (8).

Endoscopies for hemoclip application were carried out using a Fujinon EG 250WR5 endoscope (Fujinon, Tokyo, Japan) under general anesthesia. Endoscopic hemoclip therapy was performed with stainless steel hemoclips (HX-610 135 Olympus Medical Systems, Japan). Hemoclips were applied with a clip application rotatable clip-device (HX-110LR, Olympus, Japan), passed through the 2.8-mm diameter accessory channel of a standard endoscope. After passage through the endoscope channel, the stopper on the clip is removed and the cylinder is pulled back, exposing the clip. The slider is slowly pulled back, opening the clip to its maximum width. The clip is pressed against the lesion, a small amount of suction is applied prior to deployment, allowing the lumen to collapse, and the slider is quickly pulled back; this closes the clip and deploys it. The first clip is placed on the bleeding point, and subsequent clips may be placed around the bleeding point to occlude the submucosal vessel (opposite to the technique of the heater probe application). The clip dislodges spontaneously after application. After therapeutic endoscopy, all patients were given physical care, such as monitoring vital signs, fasting, intravenous fluid, intravenous administration of proton pump inhibitors, and prophylactic antibiotics.

Table 1. Causes of UGB in the study population (n=158)

Causes	n (%)
Esophageal varices	23 (14.5)
Peptic ulcer (duodenal, gastric)	48 (30.3)
Gastritis	40 (25.3)
Esophagitis	5 (3.1)
Erosive/hemorrhagic gastritis	18 (11.3)
Mallory-Weiss tear	3 (1.8)
Caustic ingestion	1 (0.6)
Polyps	3 (1.8)
Vascular malformations	3 (1.8)
Dieulafoy lesion	1 (0.6)
Undetermined	10 (6.3)

UGB: upper gastrointestinal bleeding

The following outcome measures were recorded: initial homeostasis; rebleeding, need for emergent surgery, and 30-day mortality. Initial homeostasis was defined as the absence of bleeding after intervention. Rebleeding or recurrent bleeding was defined as blood in the stomach 24 h after treatment, presence of unstable vital signs, decrease in hemoglobin values, and continued tarry or bloody stools or hematemesis after treatment. If rebleeding was suspected, an emergency endoscopy was performed to confirm the rebleeding and for endoscopic application.

The study was retrospective and based on file records; therefore, it did not need approval by the institutional review board or local ethics committee.

RESULTS

The demographic and clinical findings of the patients are shown in Table 2. Ten patients (66.6%) had gastric ulcer, 3 (20%) had duodenal ulcer, 1 (6.7%) had Dieulafoy lesion, and 1 (6.7%) had bleeding at the post-polypectomy site (Figure 1).

Six patients had a history of NSAID usage, 2 had *H. pylori*-associated peptic ulcer. Two patients were followed up in a pediatric oncology unit and consulted for UGB. One patient was admitted for severe microcytic anemia; endoscopy revealed 2

Table 2. Demographic and clinical findings of the patients

Patient number	Age/ gender	Etiology and /or basal disease	Localization of bleeding lesion	Size of ulcer	Forrest classification
1	14/M	PV thrombosis	DPW	<10 mm	F1b
2	12/F	Post-polypectomy	DPW	-	-
3	12/M	Neuroblastoma	DAW	<10 mm	F1b
4	3/M	NSAID usage	A	<10 mm	F1b
5	4/M	NSAID usage	A	<10 mm	F1b
6	11/F	NSAID usage	A	<10 mm	F2a
7	11/M	-	F	<10 mm	F1b
8	15/F	NSAID usage	A	>10 mm	F1b
9	11/F	*H. pylori*	DAW	<10 mm	F2a
10	13/M	Medulloblastoma	C, A	>10 mm	F2a
11	8/F	*H. pylori*	DAW	<10 mm	F1b
12	4/M	Dieulafoy lesion	C	-	-
13	5/F	NSAID usage	A	<10 mm	F2a
14	12/M	Celiac disease	C	>10 mm	F1b
15	15/F	NSAID usage	A	<10 mm	F1b

A: antrum; C: corpus: F: fundus; DAW: duodenal anterior wall; DPW: duodenal posterior wall; NSAID: non-steroidal antiinflamatory drugs

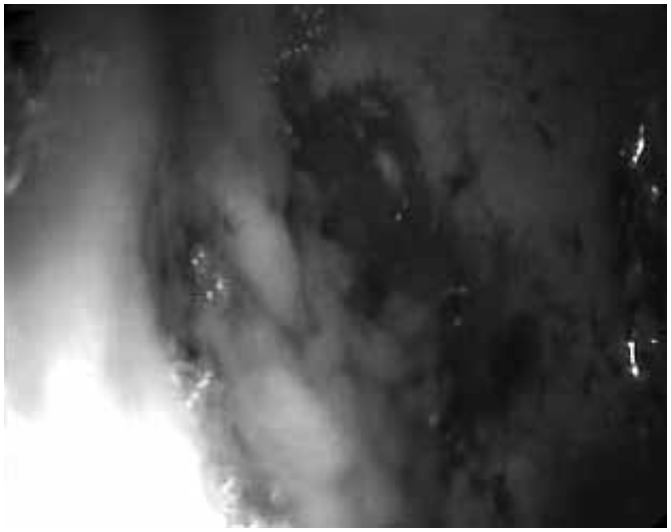

Figure 1. Endoscopic appearance of Dieulafoy lesion.

polyps on the posterior duodenal wall, and hemoclips were applied for the bleeding at the polypectomy site. One patient was followed up for portal vein thrombosis and underwent distal splenorenal shunt operation 3 years ago. He was admitted with massive UGB and hypovolemic shock, and endoscopy revealed a duodenal ulcer on the posterior wall. One patient with celiac disease presented with UGB while on a gluten-free diet, and endoscopy revealed gastric ulcer.

The size of the ulcer was >10 mm in 3 patients (2 cm in 2 patients and 2-3 cm in 1 patient), and hemorrhagic activity according to Forrest classification was F1b in 9 and F2a in 4 patients.

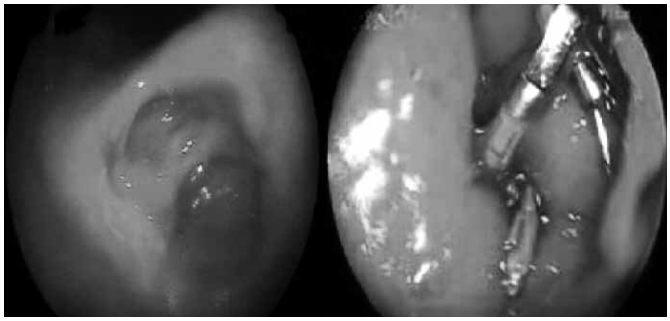

Figure 2. a, b. Duodenal ulcer locate on the posterior wall **(a).** Endoscopic appearance of hemoclip application **(b).**

After hemodynamic stabilization of the patients, all of them underwent hemoclip application (Figure 2). The mean lowest hemoglobin±SD values before the endoscopic application were 7.3±1.2 mg/dL (range; 5.6-9.3 mg/dL), and the patients with unstable vital signs were given erythrocyte suspension (median 1 U, range 0 to 3 U). Initial homeostasis after hemoclip application was achieved in all patients (100%). Rebleeding was seen in only 1 patient (6.5%) with Dieulafoy lesion, who needed hemoclip application for a second time, and the bleeding was controlled successfully. Permanent hemostasis was 100%. The median number of hemoclips used per case and per application was 3.4 (range; 2 to 6) and 3.2 (range; 2 to 5), respectively (Table 3). None of the patients needed erythrocyte suspension after application (mean hemoglobin value; 9.4±0.5 mg/dL). None of the patients experienced any complication related to hemoclip application. Median duration of hospitalization was 6 days (range; 5 to 12 days). On the follow-up, none of the patients received surgical therapy, and the 30-d mortality related to bleeding was 0%.

Table 3. Laboratory findings and outcome of the patients

Patient number	Hemoglobin level* (gr/dL)	Erythrocyte transfusion (unit)	Number of hemoclips	Hemoglobin level+ (gr/dL)	Duration of hospitalization (days)	Follow-up time (months)
1	5.6	3	4	9.3	12	20
2	5.7	2	5	10.3	6	16
3	6.7	1	3	9.9	7	10
4	7.0	1	2	9.2	6	9
5	6.5	1	3	8.7	8	6
6	6.8	1	3	9.4	6	5
7	8.7	-	4	9.2	5	12
8	9.4	-	3	10.4	6	5
9	8.3	-	3	9.8	6	7
10	6.5	2	5	9.0	8	8
11	7.0	1	3	9.5	7	7
12	6.4-6.6[&]	2	4/2	8.9	10	28
13	8.9	-	2	9.8	5	7
14	6.9	1	3	8.8	8	12
15	9.3	-	2	10.2	6	8

*Lowest hemoglobin level previous to hemoclip application; +hemoglobin levels after 48 h of hemoclip application; &hemoclips were applied two times

DISCUSSION

In this study, we showed that endoscopic hemoclip application for nonvariceal UGB is an effective and safe modality in children. It has a high initial hemostatic rate (100%) and low rebleeding rate (6.5%).

Therapeutic endoscopy has generally been recommended as first-line treatment in patients with active bleeding or with high-risk stigmata in order to reduce the need for emergent surgery, recurrent bleeding, and mortality (7). However, due to technical limitations and lack of experience of pediatric endoscopists, reports about the efficacy and outcome of these therapeutic endoscopy techniques in children are rare. It was shown that endoscopic hemoclip application had a higher success rate for primary hemostasis and lower rebleeding rate, shorter hospitalization, and fewer transfusion requirements than both injection and thermocoagulation techniques in adult patients (9,10).

Primary hemostasis rates with hemoclip application were between 85% to 100% for bleeding peptic ulcers (mainly over 95%), 95% for Dieulafoy lesion, and approximately 90% for other lesions (9). The limitations for clip application are the location and size of the lesions. Lesions on the lesser curvature and on the posterior duodenal wall are difficult to approach for clipping directly or in retroflexed position. Additionally, if the ulcer is very large (>30 mm) and beyond the width of the clip, it is difficult to achieve hemostasis using a hemoclip.

Lai et al. (10) reported successful hemostasis in 95% of 40 patients who presented with ulcer bleeding. Recurrent bleeding rates were slightly higher in spurting ulcers (15%) than with oozing ulcers (4%). They were not able to place the clips in 2 patients (5%) because of technical difficulties. In contrast, Villanueva et al. (11) reported that hemoclips could not be placed in about 19% of patients with bleeding chronic peptic ulcers. The majority of these patients had chronic ulcers with fibrotic bases, and hemoclips would not adhere to the ulcer base or the stigmata.

The rebleeding rate after hemoclip application varies from 1.8% to 20% (9,12). The presence of shock on admission and visible vessels predict rebleeding in adult patients. The presence of an adherent clot with and without hypovolemic shock has rebleeding rates of 50% and 17%, respectively (10,12,13). Lai et al. (10) showed that F1a with shock had the highest rebleeding rate. In our study, we were not able to analyze the risk factors for rebleeding due to the small number of patients; only 1 patient with a Dieulafoy lesion in the gastric corpus rebled after hemoclip application. Dieulafoy lesions are abnormal winding arterial vessels that project onto the muscularis mucosa of the gastrointestinal tract and can initiate massive bleeding. They have been reported in all parts of the gastrointestinal tract; however, approximately half of the cases are located in the proximal stomach in childhood (9,12,14). Experiences with the use of endoscopic clips in gastric Dieulafoy lesions in children only include only case reports; Lee et al. (15) reported the use of hemoclips to control bleeding from a gastric Dieulafoy lesion in a newborn infant (3d) successfully.

The limitations of our study are that our study includes patients who were only given hemoclips, and we could not compare the efficiency of hemoclips with other therapeutic modalities due to the small number of patients. The increase in experiences with the use of these therapeutic endoscopic modalities in children will help us determine the clinical indications of these therapeutic endoscopic modalities.

In conclusion, we report our experience with the use of hemoclips for nonvariceal UGB in children; it is an effective modality to control bleeding without any complications in children.

Ethics Committee Approval: N/A.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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Conflict of Interest: No conflict of interest was declared by the authors.

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