

## **New Method of Endoscopic Hemostasis in Complicated Bleeding Gastroduodenal Ulcers**

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### **ABSTRACT:**

The article presents an improved technique of endoscopic hemostasis in gastroduodenal bleeding and provides data on the assessment of its clinical effectiveness. The proposed method of hemostasis for gastroduodenal ulcers complicated by bleeding is carried out by endoscopic application of a new domestic hemostatic composite made on the basis of the Hecprocel substance. The polymer in the form of a powdery substance was sprayed endoscopically using a special delivery device. The formation of a film over the ulcer implied not only an increase in the hemostatic effect, but also the provision of a barrier (protective) function from the effects of digestive juice. The results showed that the proposed method of endohemostasis in gastroduodenal ulcerative bleeding can significantly reduce the risk of recurrence of hemorrhagic syndrome, the need for surgical treatment and mortality rates.

**Keywords:** bleeding gastroduodenal ulcer, endoscopic hemostasis, ulcer defect, hemostatic effect, stop bleeding.

### **INTRODUCTION.**

Acute erosive and ulcerative lesions of the mucous membrane of the stomach and duodenum are found in 3-4% with diagnostic esophagogastroduodenoscopy. However, the true incidence of these mucosal lesions has not been established. Acute erosions and ulcers are found more often when complications such as bleeding (60-70%) or perforation (0.5-3% of cases of acute ulcers) appear [1, 2]. Mortality in gastroduodenal ulcers complicated by bleeding in patients in intensive care units reaches 80% [4, 5].

It is generally accepted that gastroduodenal bleeding should be considered as an indication for urgent endoscopic examination, the diagnostic efficiency of which is the higher the earlier it is performed [6, 7]. This situation can be almost fully attributed to the use of local therapeutic effects on the source of bleeding through an endoscope. The emerging possibilities of endoscopic hemostasis to a certain extent expanded the indications for endoscopic examination in the most severe contingent of patients with serious concomitant diseases [8]

To influence the source of bleeding through an endoscope, various methods are used that differ in their physical properties and mechanisms of action. Currently, according to the literature, the following methods of endoscopic hemostasis are most often used: thermal (electrocoagulation, thermocauterization, laser photocoagulation, argon-plasma coagulation), injection (adrenaline, sclerosants (chemical coagulation + dehydration), cyanoacrylates, thrombin), and mechanical (clipping, ligation of the vessel and the source of bleeding) [9].

One of the promising directions on this problem is the development of new biocompatible materials and the creation of specialized biomedical products from them [10, 11]. A search is underway for technologies to create bio-artificial materials and organs, which are a system of materials of artificial or biological origin, including functioning cells of organs and tissues, or

stimulating the regeneration of the corresponding cells in the implantation zone. The most demanded are resorbable materials with high biocompatibility.

The article presents an original method for endoscopic hemostasis using the domestic drug "Heprocel" and an assessment of its effectiveness on clinical material.

## **MATERIAL AND METHODS.**

The proposed method for the endoscopic treatment of acute hemorrhagic processes on the mucous membranes of the esophagus, stomach and duodenum includes the introduction of an endoscope, cleaning the surface lesions and applying the therapeutic composition to the affected surface under visual control, differs in that on the affected surface with signs of bleeding using a delivery device, consisting of an injection mechanism and a catheter, passed through the working channel of the endoscope, a therapeutic composition is applied based on the substance "Heprocel" (composite polymer material from derivatives of cotton cellulose), while "Heprocel" is used in the form of a powder, the composition is applied to the affected surface in an amount of 300 mg from a distance of 1.0 cm from the place of damage.

"Heprocel" - a hemostatic, biodegradable polycomposite implant in the form of a powder (Fig. 1), was used by us as a contact hemostatic agent for gastroduodenal bleeding.



**Figure: 1. Powdered form of hemostatic implant**

### **"HEPROCEL"**

The implant was developed by the staff of the experimental department of the "Republican Specialized Center Of Surgery Named Of Academician V.Vakhidov" jointly with the Research Institute of Chemistry and Physics of Polymers of the Academy of Sciences of the Republic of Uzbekistan. The structure of "Heprocel" includes purified sodium salt of carboxymethylcellulose associated with calcium ions; nanocellulose and oxidized cellulose (Patent No. IAP 20160273).

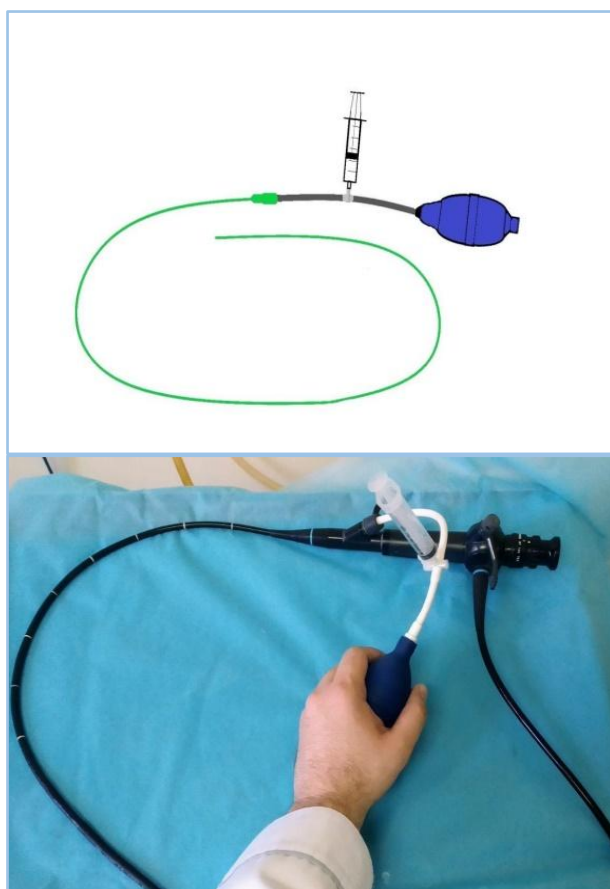
"Heprocel" is a finely dispersed powder of white-cream color. At 20°C solubility in water is 10 mg / l, well soluble in most organic solvents. Stable at pH 6-7. It hydrolyzes quickly in an

alkaline environment, more stable in an acidic environment. The specification is given in table. 1.

**Table 1.**  
**Specification "Heprocel"**

Indicators	Norm
Appearance	Finely dispersed powder
Color	White-cream
PH value of 1% solution	6-7
Particle size, $\mu\text{m}$	100-150
Solubility in water, no more, hour	five
Sterility	Sterile
Tightness	Hermetically

A delivery device in the form of a separate and removable nebulization catheter, the proximal end of which is provided with a cuff for air injection, can be placed in the working channel of the endoscope (Fig. 2).



**Figure: 2. Scheme and appearance of the delivery device in the endoscope channel**

The method was carried out as follows: the patient in the supine position, fibrogastroduodenoscopy is performed in cases of bleeding ulcers of the gastrointestinal tract, in which an ulcer with signs of bleeding is detected, cleaned by irrigation with distilled water or saline solution. Having determined the required amount of the hemostatic drug "Heprocel", a delivery device is inserted into the working channel of the endoscope, consisting of an injection mechanism and a catheter, through which the therapeutic composition is applied to the affected surface in an amount of 100-300 mg from a distance of 1.0 cm from the injury site.

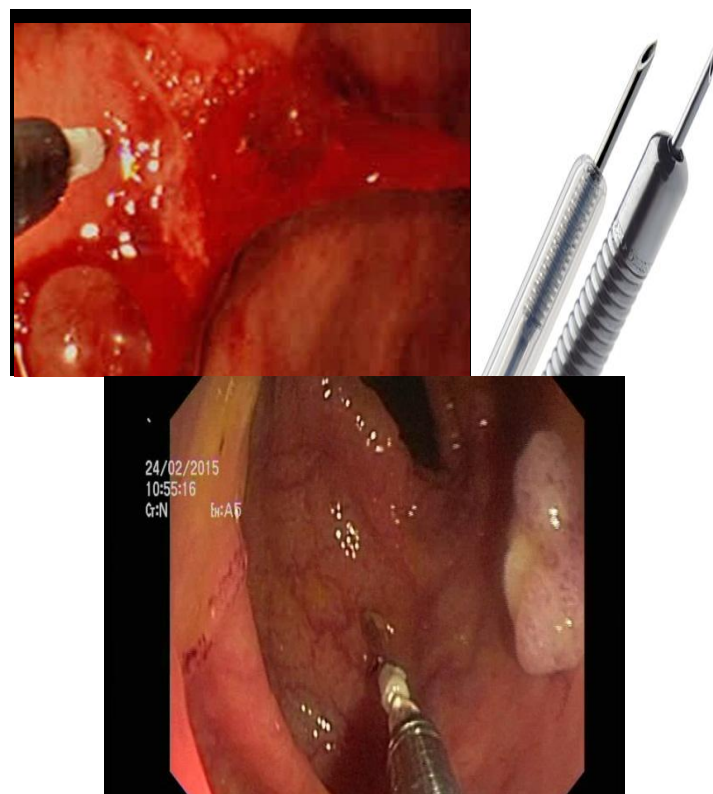
The study group included 267 patients, for whom, in addition to endoscopic hemostasis with active bleeding (46 patients), manipulation was supplemented by the implementation of the proposed method of endoscopic treatment of gastroduodenal bleeding of ulcerative genesis. When stopped bleeding was detected (221 patients), endoscopic intervention was also accompanied by the proposed method.

## RESULTS.

During endoscopic studies, it was noted that immediately after applying the powdered hemostatic drug "Heprocel" to the bleeding defect, the bleeding quickly stopped due to the formation of a uniform layer of the hemostatic drug 1-2 mm thick and a thrombus.

In 46 cases of jet bleeding, a combination of techniques was an obligatory option, namely: the initially bleeding jet was interrupted by an injection method, then a domestic polymer was applied immediately. When the bleeding stopped, only our method was used - 221 patients.

It should also be noted that the injection method can be used in almost all cases of active ulcerative bleeding. A relative contraindication to its use may be the diffuse nature of the mucosal lesion, in which the method proposed by us will be an alternative.



**Figure: 3. Endophoto: injection hemostasis with jet bleeding from a stomach ulcer and the appearance of Teflon needles**

When carrying out infiltration hemostasis, we mainly used 0.1% solution of epinephrine hydrochloride or 70% solution of ethyl alcohol in combination with novocaine, chipping of which was carried out using metal or plastic endoscopic injectors such as NM - 47L-1, NM-200L-0421 manufactured by Olympus with diameter 21-23 G (for 2.8 mm instrument channel) and retractable needle length 4-6 mm.

The injector is a sterile, disposable needle and an autoclavable spiral stainless steel sheath. The sheath of the sheath is equipped with a flexible distal tube to facilitate insertion into the instrument channel of the endoscope. The advent of Teflon catheters made it possible to provide the necessary flexibility and rigidity, guaranteeing safe needle insertion, and facilitating the introduction of the needle into the submucosal layer, which is especially convenient for submucous injections during endohemostasis.

To achieve hydraulic compression of the bleeding vessels of the ulcerative crater, the endoscopic injector needle, passed through the biopsy channel of the endoscope, is injected to the maximum depth in the periulcerous zone, 2-3 mm from the source of bleeding, alternately from 5-6 points. Through an injector, a drug is injected into the wall of the stomach or duodenum in a volume of up to 50-300 ml until a distinct bulging roller is formed around the source of bleeding ("infiltration tourniquet"). Usually 30-80 ml of solution is sufficient for complete hemostasis or for a sharp decrease in the intensity of bleeding (Fig. 3).

In duodenal ulcers (DU), the frequency of recurrent bleeding was 3.1% (in 1 of 32 patients) in the subgroup with active bleeding with endohemostasis and 1.9% (in 3 of 188) in the subgroup with stopped bleeding (Table 2).

**Table 2.**  
**Frequency of recurrent bleeding depending on the location of the ulcer**

Treatment	n	relapse	%
<b>Duodenal ulcer</b>			
Relapse after endohemostasis	32	1	3,1%
Relapse against the background of conservative tactics	156	3	1,9%
Total	188	4	2,1%
<b>Stomach ulcer</b>			
Relapse after endohemostasis	14	0	0,0%
Relapse against the background of conservative tactics	65	1	1,5%
Total	79	1	1,3%

Endoscopic treatment of bleeding in ulcer also showed a high efficiency of the proposed technique. So, after endohemostasis, there were no relapses of bleeding, and after application against the background of stopped bleeding, relapse was noted in 1 (1.5%) of 65 cases (the reliability was not noted due to the small sample in the groups).

In general, relapses were noted in 5 (1.9%) cases. Accordingly, there were 262 (98.1%) patients without recurrent bleeding.

It is interesting to analyze the recurrence of hemorrhagic syndrome depending on the initial activity of bleeding. Thus, the analysis of the effectiveness of the proposed method of endoscopic hemostasis in clinical practice made it possible to reduce the likelihood of recurrence with the initial activity of Forrest I from an ulcer in the duodenum to 4.0% (in 1 out of 25). With Forrest II, this figure was 2.0% (3 out of 153). With Forrest III, out of 10 observed patients, no recurrent bleeding was observed. With bleeding against the background of ulcer and initial Forrest I activity, relapse was noted in 7.1% (1 of 14) cases. Under Forrest II, this

figure was 0% (out of 63). With Forrest III, out of 2 observed patients, recurrent bleeding was also not noted (Table 3).

**Table 3.**  
**Frequency of recurrence depending on the activity of bleeding**

Bleeding activity	n	relapse	%
Duodenal ulcers			
Forrest I	25	1	4,0%
Forrest II	153	3	2,0%
Forrest III	10	0	0,0%
Stomach ulcers			
Forrest I	14	1	7,1%
Forrest II	63	0	0,0%
Forrest III	2	0	0,0%

Overall, the relapse rate for Forrest I was 5.1% (2 out of 39) and 1.4% for Forrest II (3 out of 216). In this context, the results obtained indicate not only an improvement in the hemostatic effect due to the application of the Hecprocel substance on the surface of the ulcer, but also that the good adhesive properties of the polymer, promoting the formation of a protective film, also reduced the risk of the influence of provoking factors, that is, provided barrier function.

Reducing the risk of recurrence influenced the need for surgical treatment of bleeding ulcers. In duodenal ulcer after endohemostasis, only 2 (1.3%) patients with relapse after spontaneous hemostasis were operated on. In total, 2 (1.1%) patients were operated on in the subgroup with DU. In case of stomach ulcer (SU) with relapse, 1 (1.3%) patient was operated on.

**Table 4.**  
**Number of operated patients in comparison groups**

Treatment	n	operated on	%
Duodenal ulcer			
Endohemostasis	32	0	0,0%
Conservative	156	2	1,3%
Total	188	2	1,1%
Stomach ulcer			
Endohemostasis	14	0	0,0%
Conservative	65	1	1,5%
Total	79	1	1,3%

In the subgroup with DU, 1 (0.5%) death was noted. Against the background of bleeding from a stomach ulcer, this figure was 1.3% (1 patient).

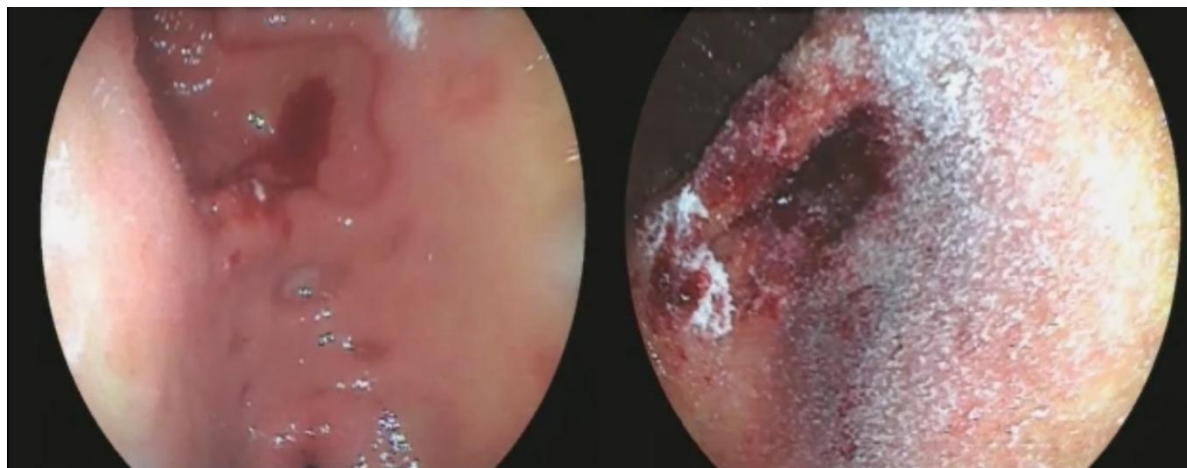
To illustrate what has been said, we give two examples from clinical practice.

**Example 1.** *Patient A., 37 years old, from 06/15/2020 to 06/25/2020, received treatment in the Department of I-surgery of the RSCEMP Andijan branch with a diagnosis of cirrhosis of the liver. Portal hypertension. Varicose veins of the esophagus 2 tbsp. Ascites. Splenomega-*



*ly. Peptic ulcer of the stomach and duodenum, complicated by bleeding from a duodenal ulcer. Forrest 2 A.*

*Endoscopy reveals a bleeding defect in the duodenum (Fig. 4). According to the developed method, the prepared hemostatic drug "Heprocel" is insufflated onto the damaged area through a delivery device inserted into the working channel of the endoscope in the form of a separate removable nebulizing catheter, the proximal end of which is equipped with a cuff for air injection (Fig. 4).*



**Figure: 4. Endoscopic picture of bleeding from the duodenal ulcer and after insufflation of the hemostatic drug "Heprocel" in the form of a powder on the area of the ulcer with stopping bleeding**

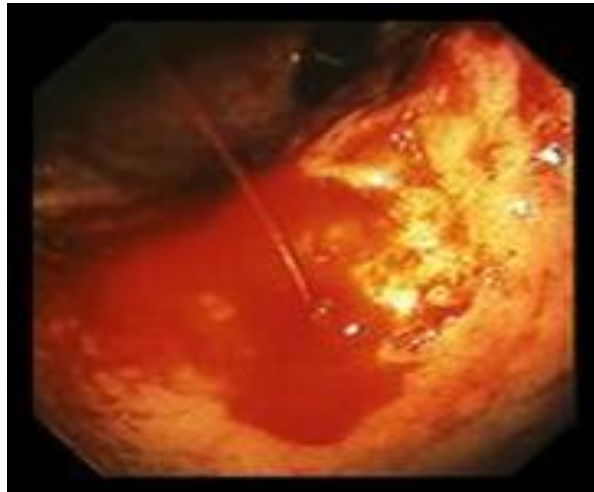
*After 3 days, on the control endoscopy, the epithelialization of the defect is determined, with the cessation of bleeding. On the 4th day of being in the hospital, the patient's condition with improvement, was discharged in a satisfactory condition.*

**Example 2.** *Patient S. 05.03.1987, year of birth Place of residence: Andijan region, Bulokbo-shinsky district, st. Toshkechik. Case history number: 24030/1839. Date of receipt: 26.11.2019 11.41 hour Date of discharge: 29.11.2019. 12.30 a.m. Diagnosis: Duodenal ulcer disease. Complication: bleeding F – I B.*

*Complaints at admission: pain in the epigastric region, vomiting mixed with blood, childlike stools, dizziness, darkening before the eyes, general weakness.*

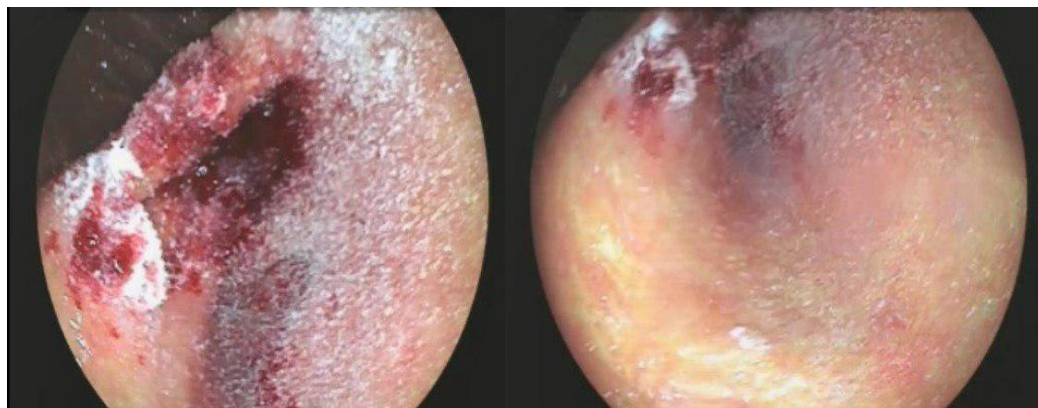
*From the anamnesis: From the patient's words, the disease began 2 days ago. The patient was taking painkillers. Condition at admission: moderate. The skin is pale. Breathing is vesicular. BP 100/60 mm Hg Pulse 90 per minute. Tongue dry, no plaque. The abdomen is soft and painless. The stool was black. Examinations: GBA: Hemoglobin 80 g / l, Erythrocytes 3.0, Color index 0.8, Leukocytes 4.9, blood coagulation time 300-400, Hematocrit 28%. ECG: Sinus rhythm, correct. Heart rate 86 per minute. The normal position of the EAH. Biochemical blood tests: Total protein 75 g / l, total bilirubin 12.3 Mmol / l, direct - abs, ALT 0.53 u / l*

*FGDS No. 1716: "Kissing ulcers" of the duodenal bulb with deformation. Erosive gastritis. Complication: bleeding according to F – I B. (Fig. 5)*



**Figure: 5. Endophoto: active bleeding from duodenal ulcer**

*In order to stop bleeding, diathermocoagulation was used in combination with an injection of epinephrine 1% -1.0 + alcohol 70% -4.0 + sodium chloride 0.9% -5.0 around the ulcer. Also, endoscopic implantation of the hemostatic agent "Heprocel" in the form of a powder over the ulcer was performed. Bleeding stopped (Fig. 6).*



**Figure: 6. Endophoto: Heprocel pneumoinflation immediately after stopping bleeding (left image) and 3 minutes after (right image)**

*In dynamics, the general condition of the patient is satisfactory, the skin is pale. Hemodynamics are stable. Tongue dry, with whitish deposits. The abdomen is soft, painless. On repeated endoscopic examination on November 28, 2019, in the area of the ulcer defect there is a dense film covering the ulcer; active scarring of the ulcer defect was determined (Fig. 7).*





**Figure: 7. Endophoto: control endoscopy two days after bleeding and endoscopic hemostasis "Heprocel»**

*After conservative therapy, the patient's condition improved and on 11/29/2019, he was discharged.*

## **CONCLUSION.**

The proposed method for endoscopic treatment of gastroduodenal bleeding of ulcerative genesis is characterized by the possibility of applying a film-forming polymer made on the basis of the domestic substance "Heprocel" by using a special delivery device introduced into the endoscope channel for controlled introduction and placement of a hemostatic agent over a bleeding erosive-ulcerative mucosal defect.

A prospective study of the effectiveness of the proposed method of endoscopic hemostasis in clinical practice showed that the application of a composite polymer material over an ulcer defect reduces the frequency of the next recurrence of hemorrhagic syndrome to 1.9% (in 5 out of 267 patients), reducing the need for surgical treatment to 1.1% (3 patients) and, accordingly, the mortality rate is up to 0.7%.

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