Tissue Solidification in Coping with Digestive Tract Bleeding: Hemostatic Effect of Local Injection of 99.5% Ethanol

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ASAKI S. *Tissue Solidification in Coping with Digestive Tract Bleeding: Hemostatic Effect of Local Injection of 99.5% Ethanol.* Tohoku J. exp. Med., 1981, 134 (3), 223-227 — Tatsuka et al. reported a local injection of 95% ethanol as a new endoscopic treatment of gastric protuberant lesions. In this method, the present author discovered that 99.5% ethanol injection has an excellent hemostatic effect. The author injected 99.5% ethanol into the cut-end of the stalk of 7 massively hemorrhaged cases encountered while performing double snare polypectomy. In all cases, the hemorrhage stopped within 5 or 15 min. In 9 patients with hemorrhagic gastric or duodenal ulcer who were judged at emergency endoscopic examination as needing some hemostatic treatment, an injection of 99.5% ethanol into the bleeding site achieved a satisfactory hemostasis in all of them. Ethanol injection into the surrounding tissue close to the bleeding vessels, a few injecting sites selected usually at 1 to 2 mm away from the bleeding vessels, 0.1 to 0.2 ml a time, could instantly suppress even the pulsatile bleeding with no hazards. If this method is used carefully with endoscopic skill, this should become the first choice for the gastro-intestinal hemorrhage except varices. ——— G-I bleeding; tissue solidification; endoscopy; ethanol injection; hemostatic effect

It has been discovered by the present author that 99.5% ethanol locally injected has a hemostatic effect besides its known action of dehydrating and solidifying tissue. Ethanol, when acted on the cut-end of a blood vessel, stimulates the place and causes a transitory increase in bleeding, but it has newly been made clear that, when injected into a spot within the tissue surrounding the bleeding vessel, it causes the whole tissue involving the vessel to become solidified, eventually suppressing bleeding. Such a hemostatic effect was demonstrated when 99.5% ethanol was locally injected endoscopically in 7 cases of gastric polyps with evidence of major bleeding from the cut-end of the polyp stalks after high-frequency-current-applied endoscopic polypectomy and 9 other cases of hemorrhagic gastric or duodenal ulcer identified in emergency endoscopic examinations. In all cases, the effect of hemostasis was quite remarkable. This report offers the findings obtained in the author's experience.

MATERIALS

A local injection of 99.5% ethanol was carried out in a total of 16 instances at the Third Department of Internal Medicine, Tohoku University Hospital—including 7 gastric polyps with the cut-end of their stalks spurting blood in profusion after their resection by double-snare polypectomy (article under contribution to the journal), which has been applied in the same Department since 1975 to polyps over 15 mm in the largest diameter, and 9 other patients with hemorrhagic gastric or duodenal ulcer among the cases undergoing emergency endoscopic examinations to check digestive tract bleeding in this Department since June, 1979; the cases, with evidence of pulsatile hemorrhage in 1, large blood clot adhesion in 6, small blood clot adhesion in 1, and vascular exposure in 1, altogether were confirmed as needing some hemostatic treatment.

METHODS

The needle used for the local injection of 99.5% ethanol had a whole length of 1,770 mm, with an outside diameter of 2 mm, which could let its tip, 0.3 mm in outside diameter, slip out up to 5 mm (Fig. 1). Employed as Pan-Fiberscopes for emergency endoscopy were Machida-seisakusho's FGI-SD, and Olympus's GIF-Q, GIF-D₃. With the needle led through one channel of the fiberscope, 99.5% ethanol was injected endoscopically into the bleeding spot or at a point within the surrounding tissue. With a one-time dose of 0.2 ml, the injection was made in the same site once to thrice, eventually attaining a satisfactory effect of hemostasis in all cases.

Fig. 1. Injection apparatus.

RESULTS

Table 1 shows the hemostatic effects of 99.5% ethanol injections in the 16 cases. In all cases bleeding was brought under control in the initial treatment. In Case No. 13, in which bloody excrements remained uncontrolled, a re-examination the next day revealed another hemorrhagic duodenal ulcer with bleeding at two sites, one on its center and the other at a spot in the circumferential tissue. New injections of 99.5% ethanol into the bleeding sites could control bleeding in this case, with tarry excrements disappearing later. Although, with the exception of the

TABLE 1. *Summarized results of ethanol injection*

1. Cases treated by double-snare polypectomy

Case No.	Age	Sex	Location	Shape	Size (mm)	Grade of hemorrhage	Bleeding after treatment	Result
1	53	F	Antrum	Pedunculated	20	Massive	Complete cessation of bleeding	Successful
2	58	F	Corpus	"	33	Moderate	"	"
3	72	F	Antrum	"	20	Massive	"	"
4	73	F	Antrum	"	30	Massive	"	"
5	30	M	Antrum	"	17	Moderate	"	"
6	71	F	Corpus	"	20	Massive	"	"
7	68	F	Corpus	Semi-pedunculated	34	Moderate	"	"

2. Cases treated by emergency endoscopy

Case No.	Age	Sex	Diagnosis	Bleeding	Duration of bleeding	Complication	Grade of hemorrhage	Result
8	55	M	Large deep G.U.*	Hematemesis melena	2 days	21 days after operation of right femur fracture	Pulsatile	Successful
9	43	F	Multiple G.U.	Hematemesis	1 day	Chronic renal failure	Large blood clot	"
10	28	M	Multiple D.U.†	Melena	4 hr	7 days after operation of kidney transplantation	Pulsatile	"
11	63	F	G.U.	Hematemesis melena	5 days	None	Small blood clot	"
12	59	M	Large G.U.	Hematemesis	3 hr	Liver cirrhosis	Small blood clot	"
13	47	M	Multiple large D.U.	Melena	5 days	Diabetes mellitus 12 days after operation of laryngeal cancer	Large blood clot	"
14	45	M	Multiple large D.U.	Melena	10 days	Vegetable state	Large blood clot	"
15	58	M	D.U.	Melena	1 day	Operated right renal cancer and its breast metastasis	Large blood clot	"
16	66	M	Multiple D.U. multiple G.U.	Melena	1 day	After operation of laryngeal cancer	Small blood clot	"

* G.U., gastric ulcer; † D.U., duodenal ulcer.

7 cases of gastric polyp with evidence of local bleeding after polypectomy and Case No. 11, the remaining 8 patients had a severe complication of either chronic renal failure or liver cirrhosis, or a high risk of fatal termination after resection of a malignant tumor, there occurred no instance of re-bleeding after treatment.

DISCUSSION

Conservative procedures for controlling digestive tract bleeding include cold water rinsing through a sonde or endoscope, local diffusion or injection of vasoconstrictive agents, and other measures differently reported; spraying of clotting factors (Linscheer and Fazio 1979), clipping hemostasis (Hayashi et al. 1975), high frequency current coagulation (Papp 1975; Matek et al. 1979), and laser coagulation (Kiefhaber et al. 1977). Either of them, however, proving more or less faulty, the present author was struck with an idea that whether bleeding in the digestive tract could be suppressed if the tissue involving a bleeding site was locally solidified. Tatsuka et al. (1974) reported a local injection of 95% ethanol as a new endoscopic treatment of gastric protuberant lesions. After that, the present author took up 99.5% ethanol, injecting it into dogs to produce an experimental ulcer, and took a step forward to apply it clinically, in which it was injected into gastric polyps in hopes of letting them fall off. From these experiences it has become known that a local injection of 99.5% ethanol causes the tissue to become necrotic, remaining in place for about 3 to 7 days in the form of thick white coat. Also it became clear that 99.5% ethanol locally injected could instantly suppress bleeding from a gastric biopsy with forceps. Encouraged by these results, the author injected 99.5% ethanol into 7 gastric polyps spurting blood after high-frequency-current-applied polypectomy; endoscopically tightening the strangulating snare for hemostasis on the remaining stalk, and leading an needle through another channel, 99.5% ethanol was injected directly into the cut-end of the stalk. The effect of subduing the spurting blood was evidently positive in 5 to 15 min in all cases. Also in 9 patients with hemorrhagic gastric or duodenal ulcer who were judged at emergency endoscopic examinations as needing some hemostatic treatment, an injection of 99.5% ethanol into the bleeding site achieved a satisfactory hemostasis in all of them. Needing no special tools other than an endoscopic needle, 99.5% ethanol, and a disposable syringe the method can be handled by any one experienced in the endoscopic manipulation, at a low cost and free of causing any fateful perforation. With no accidental complications having been encountered so far, the author's formula may well be recommended as a beneficial procedure for emergency endoscopic checking of digestive tract bleeding, which is required to be carried out more often than not in the patient's ward. The depth of ethanol injection should be adjusted, particularly when it is made deep below the gastric muscularis propria causing local pain in the patient. Special care must be taken not to exceed 0.2 ml at one-time dose of injection. If stimulation of a deep place has caused pain in the patient, the injection should be suspended, while the needle is withdrawn little by little to resume injection slowly. It is

usually observed that when ethanol is placed directly on the cut-end of a blood vessel, bleeding increases transiently, but if it is injected into the surrounding tissue at a point 1 to 2 mm away from the bleeding spot, it can accurately stop bleeding. Even if bleeding remain for a few minutes, its volume will gradually decrease until it finally disappears with the sufficient solidification of the tissue. In the observed cases, with favorable local adhesion of necrotic tissue, food intake could be resumed early 24 hr after the performance of hemostatic treatment. By contrast, in other measures for hemostasis such as high frequency current coagulation and laser coagulation, necrotic tissue, usually insufficient in local adhesion, is likely to fall off in 24 to 48 hr, eventually multiplying the risk of re-bleeding and expansion of the range of damage.

Although cases of bleeding at esophageal varices are out of the indication of the proposed procedure of hemostatic tissue solidification, the method can probably be indicated for an inflammatory bleeding focus a little away from a varix.

As the present method has just been developed, further investigations must be conducted, particularly in pursuit of the conditions of deep hemorrhagic ulcer and exposed thick vessels with regard to the possible indication of the method for such cases, and also in search of drugs innocuous to the body and effective for solidification of tissue in a wider range.

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