PROPHYLACTIC ENDOSCOPIC INJECTION SCLEROTHERAPY FOR GASTRIC VARICES: 1. DEVELOPMENT OF A NEW SCLEROTHERAPY TECHNIQUE AND ITS APPLICATION

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Received September 30, 1994

Abstract: The author designed a direct injection method of endoscopic injection sclerotherapy (EIS) for gastric varices with a newly developed technique for controlling bleeding from the punctured site, and subsequently used it for prophylactic treatment in 10 cases. EIS was performed under X-ray monitoring in the absence of a balloon, and 5 % ethanolamine oleate containing 49 % Iopamidol was used as the sclerosant. A twenty-five gauge needle wearing an outer tube was used for the puncture. After injection of sclerosant, thrombin was poured into the outer tube while pulling out the needle. After the needle was pulled out, thrombin was sprayed over the punctured site when bleeding was negligible, and if bleeding was still noted, 1-2 ml of ethanol was injected into the varices. Bleeding from the punctured site was successfully controlled by spraying thrombin or ethanol injection. No other serious complications were observed. All varices treated by this technique were flattened or had disappeared after EIS, and since then no recurrent growth or bleeding has been observed. It is suggested that this direct injection method of EIS is a safe, less invasive and effective prophylactic treatment for gastric varices.

Index Terms

endoscopic injection sclerotherapy, gastric varices, prophylactic therapy, ethanolamine oleate

INTRODUCTION

Endoscopic injection sclerotherapy (EIS) is a useful prophylactic method for the prevention of recurrent bleeding from esophageal varices involved in patients with portal hypertension[1,2]. Gastric varice are also involved in these patients, and occasionally associated with serious bleeding[3]. However, the prophylactic treatment of gastric varices by EIS is uncommon, although EIS is used for acute bleeding gastric varices[3-5], because the safety and efficacy of the prophylactic use of EIS for gastric varices has not been established. Several problems are responsible for the difficulty in prophylactic use of EIS for gastric varices. First, the injected sclerosant apparently enters the systemic circulation easily because intravariceal blood-flow is hardly interrupted. Thus, the formation of a thrombus sufficient to give sclerosing effect may not be obtainable, and complications in the systemic circulation may occur. Second, a method for prevention and control of bleeding from the punctured site has not been established. In this study, I designed a direct injection method of EIS for gastric varices with a newly developed technique for controlling bleeding from the punctured site, and subsequently used it for prophylactic treatment. The results revealed that the method is safe and effective for prophy-

lactic treatment of gastric varices.

PATIENTS AND METHODS

Patients

Ten patients with risky gastric varices (nodular form, tumorous form varices and/or varices with red marking or erosion) involved in liver cirrhosis were entered in this study with their informed consent. These cases were not selected but all the cases I have had since this study was begun. The patients' characteristics and backgrounds are shown in Table 1. Special medications such as β-blocking agents were not administered to these patients.

Table 1. Characteristics and backgrounds of patients

	Case NO.									
	1	2	3	4	5	6	7	8	9	10
Age (years)	53	66	59	51	58	40	64	52	58	62
Sex (M or F)	M	F	M	M	F	M	M	M	M	M
Cause of cirrhosis										
Alcoholic			+	+		+	+		+	
Others	+	+			+			+		+
Concomitant hepatoma		+	+				+			+
Child's grading	C	B	A	A	B	B	C	B	A	C
Liver function										
Albumin (g/dl)	2.0	3.3	3.3	3.5	3.1	3.5	2.9	3.0	3.5	2.5
Bilirubin (mg/dl)	2.2	0.9	1.4	0.8	1.4	2.1	3.9	2.4	1.7	3.2
Prothrombin time (sec over control)	0.5	1.5	3.4	0.5	2.4	0.1	3.0	2.7	-0.6	1.8
Previous variceal bleeding(n)	1	2	3	1	1	1	—	—	—	—
Previous EIS(n)	3	4	10	6	6	2	—	3	—	—

Previous variceal bleedings are all from esophageal varices.
Previous sclerotherapies are all for esophageal varices, and one treatment course was completed by 2~4 procedures of EIS.

Methods

EIS was performed using an Olympus GIF-Q_{10} flexible endoscope (Olympus, Tokyo, Japan) under X-ray monitoring in the absence of a balloon, and 5 % ethanolamine oleate containing 49 % Iopamidol (EOI) was used as the sclerosant. An endoscope was fixed at the retroflexion position, and a puncture was made. A disposable twenty-five gauge needle wearing an outer tube with a side hole (obtained from Top Corporation, Tokyo, Japan) was used for the puncture. The technique for controlling bleeding from the punctured site is illustrated in Fig. 1. Following the intravariceal injection (A), thrombin was poured into the outer tube through the side hole and the needle was gradually pulled out while injecting a small amount of EOI (B). After the needle was pulled out, the punctured site was pressed with the outer tube for a few seconds (C). When bleeding was negligible, thrombin was sprayed over the punctured site (D). If bleeding was still noted, 1-2 ml of ethanol was injected (E). The volume of injected EOI was limited to 5 ml per injection and 10 ml per session on the basis of my experiences with the safety of injected EOI in patients with esophageal varices accompanied by shunt vessels. During the EIS, vasopressin (0.4 unit/min) was intravenously infused, and its infusion (0.1 unit/min) was

continued until 24 h after the EIS. For 4 days after EIS, 5 % sodium alginate (200 ml/day) and thrombin (4 million unit/day) were given per os, and cimetidine (400 mg/day) and sorcoseryl (4 ml/day) were administered intravenously. Except for the usual premedications, no other special medication was used for EIS.

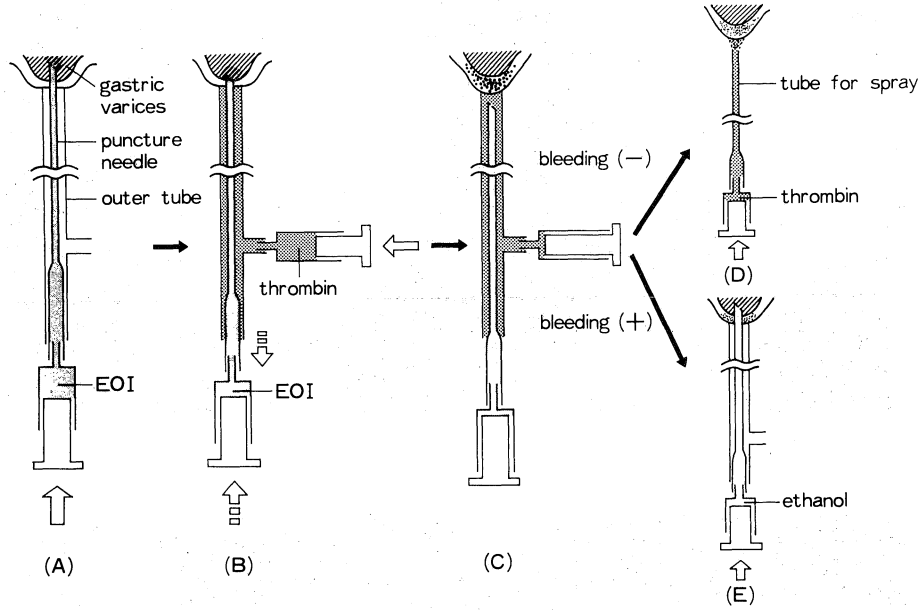

Fig. 1. Technique for controlling bleeding from the punctured site.

RESULTS

The number of EIS and volumes of injected EOIs are shown in Table 2. The mean number of EIS, mean total volume of injected EOI per case and mean volume of injected EOI per one EIS were 1.9, 8.9 ml and 4.7 ml, respectively. Endoscopic findings of gastric varices before and after EIS are shown in Table 3. The findings before EIS were observed at the first EIS in each case, and those after EIS were observed 4 weeks after the last EIS. Marked improvements were observed in the findings in all cases. For example, nodular varices on the posterior wall and greater curvature observed in Case 5 and 6 had disappeared after EIS (Figs. 2 A and 2 B). Complications of EIS, which were evaluated by clinical signs, laboratory data, ultrasonogram and endoscopy, are summarized in Table 4. The bleeding from the punctured site was

Table 2. Number of EIS and volumes of injected sclerosants

	Case NO.									
	1	2	3	4	5	6	7	8	9	10
Number of EIS	1	2	1	1	3	2	1	2	3	3
EIS interval (days)	—	19	—	—	14 45	21	—	14	14 7	7 7
Total volume of sclerosant(ml)	4.4	4.6	3.6	5.0	12.8	16.5	5.0	5.5	15.0	17.0
Mean volume of sclerosant per one EIS(ml)	4.4	2.3	3.6	5.0	4.3	8.3	5.0	2.8	5.0	5.7

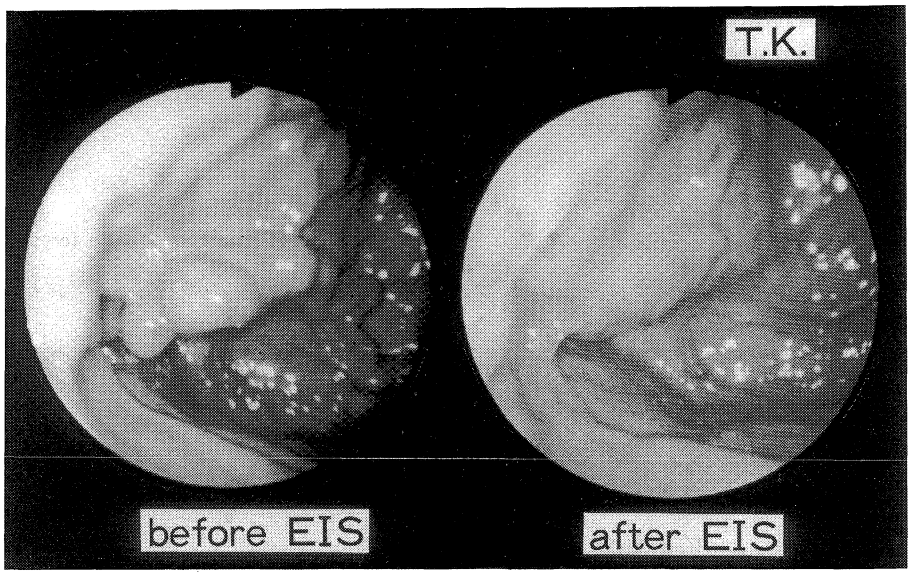

Fig. 2A. Endoscopic findings of gastric varices in Case 5 before and after EIS.

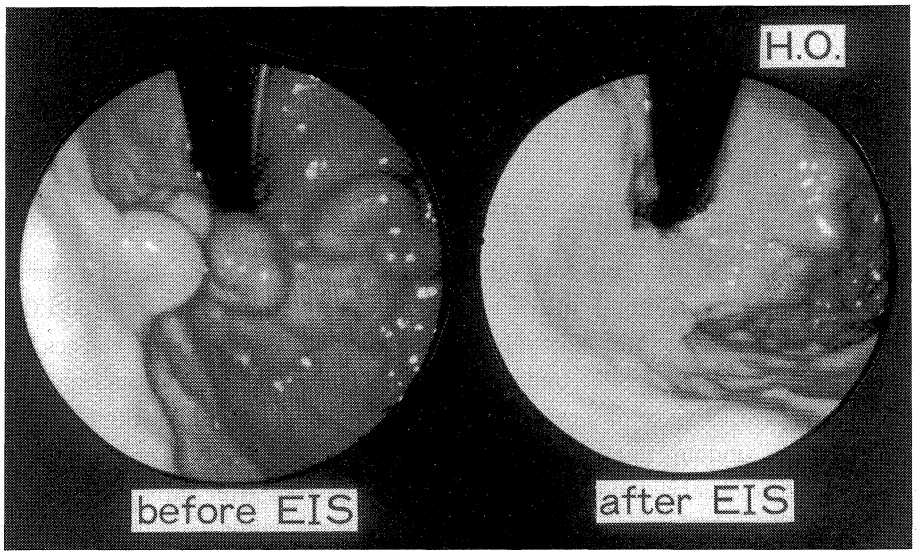

Fig. 2B. Endoscopic findings of gastric varices in Case 6 before and after EIS.

successfully controlled by the technique described in Methods. Ethanol injection for evident bleeding was required only in 2 out of 19 EIS procedures. No other serious complications were observed, and thus no special treatment was required. Recurrent growth of gastric varices or variceal bleeding has not been observed in the cases (for 4 to 30 months) after the last EIS. Except for Case 1, who died of hepatic failure 10 months after EIS, all cases had survived.

DISCUSSION

Prophylactic treatment for gastric varices depends mainly on invasive procedures such as

Table 3. Endoscopic findings of gastric varices before and after EIS

	Case NO.									
	1	2	3	4	5	6	7	8	9	10
Before EIS										
Anterior wall and lesser curvature	+			+	+	##	+		+	
Posterior wall and greater curvature	##			+	##	##	#	##	##	##
EG junction		##	##	##						
After EIS										
Anterior wall and lesser curvature	−			−	+	±	±		−	
Posterior wall and greater curvature	±			−	−	−	±	−	±	−
EG junction		±	±	−						

; nodular or tumorous, # ; rosary, + ; tortuous or arborescent, ± ; flattend, − ; disappeared, EG junction ; esophagogastric mucosal junction.
The findings before EIS were observed at the first EIS in each case, and those after EIS were observed 4 weeks after the last EIS.

Table 4. Complications of EIS

	Incidence
Anterior chest pain	8/19(42.1%)
Pain on epigastrium	2/19(10.5%)
Bleeding from punctured site	2/19(10.5%)
Hematoma	2/19(10.5%)
Ulceration	4/19(21.1%)
Gastric erosion	5/19(26.3%)
Fever	7/19(36.8%)
Hemoglebinuria	2/19(10.5%)
Pleural effusion	1/19(5.3%)
Other complications	none

Complications were evaluated by clinical signs, laboratory data, ultrasonogram and endoscopy in 4 weeks after the last EIS.

surgery. In this study, I demonstrated that prophylactic EIS for gastric varices, a less invasive procedure, can be performed safely to produce satisfactory results. Controlling bleeding from the punctured site is the most important problem in the EIS for gastric varices. By the iotravariceal injection method, compression of the punctured site by a balloon tamponade is difficult. The paravariceal injection method may be considered as another selection of EIS for gastric varices, but it is known that this method has little efficacy on sclerosing, and there is a higher risk of bleeding or perforation due to ulceration which is highly complicated by this method. In order to overcome the difficulty in the intravariceal injection method, I developed a new technique to prevent bleeding from the punctured site while pulling out the needle. Bleeding was minimized by simultaneous injection of a small amount of EOI when pulling out the needle. Following a brief compression on the punctured site with the outer tube filled by thrombin, I added a thrombin-spraying and/or an ethanol injection. Thrombin-spraying was effective for negligible bleeding in most sessions. Even evident bleeding was well controlled by

ethanol injection.

Another important problem is safety and efficacy of sclerosant for gastric varices. Unlike esophageal varices, intravariceal blood-flow is hardly interrupted with a balloon and the injected sclerosant apparently enters the systemic circulation easily in a case with gastric varices. Thus, a thrombus sufficient to give sclerosing effect is hardly obtained, and complications in the systemic circulation may occur. Ethanolamine oleate is a safe material for EIS, because it is easily inactivated when it is combined with albumin in the systemic circulation[6]. From my previous observations in patients with esophageal varices accompanied by shunt vessels, I have noted that an injection of EOI limited to 5 ml per injection never induced any complication in the systemic circulation. I confirmed this fact in the present study on patients with gastric varices as well. For safety, it is better to confirm that the sclerosant was correctly infused into varices under X-ray monitoring. As for the efficacy of EOI, the injurious action of the injected EOI on the intravariceal endothelial cells was proved to be immediate and sufficient for thrombus to be formed. Kitano et al reported that EOI induced more complete thrombosis in the esophageal varices than polidocanol[7].

In summary, by improving the method of EIS and using EOI as a sclerosant I could safely treat gastric varices. Almost all varices disappeared or flattened without any serious complication. Long-term observation of these cases revealed no bleeding and no new growing of gastric varices after EIS. From these results I concluded that EIS by this method is promising for managing risky gastric varices.

ACKNOWLEDGMENT

The author wishes to thank Dr. Tadase Tsujii, Professor of The Third Department of Internal Medicine of Nara Medical University, and my colleagues of EIS for their kind support and many helpful suggestions.

REFERENCES

1) **Paquet, K. J.**: Prophylactic endoscopic sclerosing treatment of the esophageal wall in varices: A prospective controlled randomized trial. Endoscopy **14**: 4-5, 1982.

2) **Witzel, L., Wolbergs, E.** and **Merki, H.**: Prophylactic endoscopic sclerotherapy of oesophageal varices. Lancet (April) **6**: 773-775, 1985.

3) **Trudeau, W.** and **Prindiville, T.**: Endoscopic injection sclerosis in bleeding gastric varices. Gastrointest. Endosc. **32**: 264-268, 1986.

4) **Stray, N., Jacobsen, C. D.** and **Rosseland, A.**: Injection sclerotherapy of bleeding oesophageal and gastric varices using a flexible endoscope. Acta Med. Scand. **211**: 125-129, 1982.

5) **Loperfido, S.**: Endoscopic treatment of bleeding gastric varices with bucrylate. Endoscopy **19**: 87, 1987.

6) **Kumagai, Y., Makuuchi, H.** and **Ohmori, Y.**: Indication and selection of sclerosants for esophageal sclerotherapy. The Saishin-Igaku **45**: 1224-1229, 1990.

7) **Kitano, S., Iso, Y., Koyanagi, N., Higashi, H.** and **Sugimachi, K.**: Ethanolamine oleate is superior to polidocanol (Aethoxysklerol) for endoscopic injection sclerotherapy of esophageal varices: A prospective randomized trial. Hepato-gastroenterol. **34**: 19-23, 1987.