Gastric Varices in Cirrhosis versus Extrahepatic Portal Venous Obstruction and Response to Endoscopic N-Butyl-2-cyanoacrylate Injection[☆]

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Background: Gastric varices are found in patients with portal hypertension. Incidence of bleeding from gastric varices is relatively low, but tends to be more severe, and is associated with higher mortality than esophageal variceal bleeding. **Aims and objectives:** To compare the prevalence and types of gastric varices in cirrhosis versus extrahepatic portal venous obstruction (EHPVO) and the results of endoscopic N-butyl-2-cyanoacrylate (NBC, glue) injection. **Methods:** Eighty six patients presenting with bleeding from gastric varices between August 2010 and August 2011 were retrospectively analyzed. **Results:** Of 86 patients, 65% ($n = 56$) were cirrhotics and 35% ($n = 30$) had EHPVO. Distribution of types of gastric varices showed GOV1 in 14% ($n = 8$) of cirrhotics vs. 7% ($n = 2$) of EHPVO, GOV2 in 80% ($n = 45$) of cirrhotics vs. 53% ($n = 16$) of EHPVO, IGV1 in 40% ($n = 12$) of patients with EHPVO vs. 4% ($n = 2$) cirrhotics. The patients were treated with NBC injections. The mean volume of glue injected was 3.7 ± 2.58 ml over a median of 1 session (range: 1–8). The total volume of glue required was lower in cirrhotics (3.2 ± 2 ml vs. 4.7 ± 3.1 ml, $p < 0.05$) than in EHPVO patients. Twenty (36%) of cirrhotics required >1 sessions of glue injection as compared to 17 (57%) of EHPVO patients. Over mean follow up of 12 months, rebleeding (9% vs. 10%) and mortality (11% vs. 3%) were similar in patients with cirrhosis and EHPVO. **Conclusions:** In patients with bleeding from gastric varices, GOV2 is more common in cirrhotics and IGV1 in patients with EHPVO. Patients with EHPVO required higher total volume of glue and more glue sessions for gastric varix obliteration. (J CLIN EXP HEPATOL 2013;3:19–23)

Gastric varices (GV) occur in 18%–70% of patients with portal hypertension (PHT) and are responsible for 10%–15% of all variceal bleeding.^{1–4} They may develop in the setting of either generalized or segmental (sinistral or left sided) portal hypertension.⁵ Although the incidence of bleeding from GV is relatively low (10%–36%), the prognosis of gastric variceal hemorrhage is poorer than esophageal variceal bleeding. The bleeding

tends to be more severe, to require more blood transfusion, and to have a higher mortality rate than esophageal variceal bleeding.^{6–8} Mortality associated with a first variceal bleed appears to have improved in recent years but remains as high as 20% within 6 week of the index bleed.^{6,7} GV have a high rate of rebleeding (38%–89%).^{9–11}

Endoscopic injection using N-butyl-2-cyanoacrylate (NBC, glue) for the treatment of gastric varices was first reported by Soehendra et al¹² in 1986. Current evidence favors the use of NBC as the first-line management option both for acute bleed and for secondary prophylactic eradication of GV.⁵ In the present study we retrospectively analyzed the results of endoscopic NBC injection in 86 cases of GV and the rate of rebleeding in the setting of extrahepatic portal venous obstruction (EHPVO) and cirrhosis of liver.

METHODS

86 patients who presented with PHT and bleeding from gastric varices between August 2010 and August 2011 were retrospectively analyzed for gastric varices and results of glue injection therapy. The diagnosis of PHT was suspected clinically and confirmed by endoscopic documentation of EV and/or GV. The etiology of the PHT was established by clinical, biochemical, and radiologic parameters, as caused by cirrhosis or EHPVO.

Keywords: extrahepatic portal venous obstruction, gastroesophageal varices, isolated gastric varix, endoscopic variceal ligation

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Abbreviations: GV: gastric varices; PHT: portal hypertension; TIPS: transjugular intrahepatic portosystemic shunt; IGV: isolated gastric varices; GVH: gastric variceal hemorrhage; NBC: N-butyl-2-cyanoacrylate; EHPVO: extrahepatic portal venous obstruction; SPSS: Statistical Package for Social Sciences; EVL: endoscopic variceal ligation; GOV: gastroesophageal varices

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GV were classified according to Sarin's classification.¹ The size of GV was classified according to the system suggested by Hashizume et al¹³ as Form 1 (F1), tortuous winding varices; F2, nodular shaped varices; F3, tumorous huge varices.

Acute GVH was defined as GVH less than 24 h between its clinical presentation and endoscopic treatment. Active bleeding was defined when the endoscopic findings showed active spurting or oozing of blood from GV. Rebleeding was defined as new onset of hematemesis, coffee-ground vomitus, hemochezia, or melena, with an increasing pulse rate over 100 beats/min and decreasing blood pressure below 90 mmHg after a 24-h period of stable vital signs and hemoglobin after endoscopic treatment.

Successful hemostasis was defined as vital sign stability, no drop in hemoglobin >2 g/dl and no rebleeding after NBC injection.

Treatment failure was defined as failure to control acute bleeding after one attempt with the endoscopic methods.

GV obturation was defined as firm noncollapsible varices on probing with an injector during endoscopy.

TECHNIQUE OF VARICEAL OBLITERATION

Patients with recently and actively bleeding GV were treated with NBC injection. Forward viewing video endoscopes (EG-250CT5, Fujinon, Japan) were used in all the cases. An endoscopic injector with a 21-gauge needle was used. Undiluted (i.e., not mixed with lipiodol) *N*-butyl-2-cyanoacrylate was injected intravariceally into the GV after which 2 ml of normal saline was injected to deliver the entire glue from the injector into the varix. Each varix was injected with 1–2 ml of glue depending on the size of the varix; no more than 2 ml of NBC was injected into the varix each time. After the injection, the needle was immediately withdrawn from the varix. The endoscope was then taken out with the injector inside. The injector was cut from the proximal Luer lock end, and it was withdrawn from the tip of the endoscope to prevent blockage of channel by the glue. Repeat endoscopy was performed in the same session. Obturation of GV was assessed by probing the injected varices with the injector for firmness. If the varices remained soft, the injection was repeated to achieve complete obliteration. The maximum amount of NBC was 6 ml in 1 session and 2 ml per varix. After the initial control of bleeding, a repeat endoscopy was performed after 2 weeks for treating remaining GV. Patients with nonbleeding large bulbous GV underwent primary prophylaxis by using NBC injection. Informed consent was obtained from all the patients.

FOLLOW UP

The patients were monitored for any complications like chest pain, shortness of breath, hypoxia, abdominal pain,

fever, cough, and rebleeding. Surveillance endoscopies were performed at 3 month intervals after the initial variceal obliteration to monitor for variceal recurrence.

STATISTICAL ANALYSIS

Each continuous variable between the two treatment groups was expressed as mean $\pm$ SD and analyzed with the Mann-Whitney nonparametric test. Categorical data were examined using the chi-square test. A *p* value <0.05 was considered statistically significant. All analyses were performed by using the Statistical Package for Social Sciences software (SPSS version 19.0).

RESULTS

Of the 86 patients with PHT and bleeding GV, 59 (69%) were male and 27 (31%) were female, and the mean age was 39.5 years (1–75 years). Of 86 patients, 56 (65%) had cirrhosis and 30 (35%) had EHPVO (Table 1).

The gastric variceal characteristics of patients with are shown in Table 1. GOV1 was present in 14%

Table 1 Baseline clinical characteristics of 86 patients.

Patient characteristic	Cirrhosis (n = 56)	EHPVO (n = 30)	p Value
No. of patients (male/female)	40/16	19/11	0.44
Mean age (yr)	44 $\pm$ 14	26 $\pm$ 17	0.001
Etiology of cirrhosis			
Hepatitis B	11		
Hepatitis C	7		
Alcoholic	21		
Cryptogenic	17		
Child Pugh classification (A/B/C)	12/30/14	18/9/3	0.002/0.2/0.001
Time interval between bleeding and endoscopic therapy			
<24 h	21	16	0.10
>24 h	18	10	0.001
Endoscopic therapy for prevention of bleeding	17	4	0.001
Sarin's classification of gastroesophageal varices			
GOV1	8	2	0.001
GOV2	45	16	0.001
IGV1	2	12	0.001
Form of gastric varices			
F1	0	0	
F2	28	10	0.41
F3	28	20	0.41

EHPVO: extrahepatic portal venous obstruction, GOV: gastroesophageal varices, IGV: isolated gastric varices.

Table 2 Outcome of undiluted *N*-butyl cyanoacrylate injection for the management of GV.

	Cirrhosis (n = 56)	EHPVO (n = 30)	p Value
Glue injection $\leq$ 2 ml at first session	88% (n = 49)	73% (n = 22)	0.001
>1 sessions of glue injection	36% (n = 20)	57% (n = 17)	0.4
>2 ml glue for GOV obturation	57% (n = 32)	60% (n = 12)	0.4
Total glue (ml)	3.2 $\pm$ 2	4.7 $\pm$ 3.1	0.014
Rebleeding	9% (n = 5)	10% (n = 3)	0.87
Rebleeding in <48 h	3.6% (n = 2)	6.7% (n = 2)	0.4
EVL for esophageal varices	57% (n = 31)	14% (n = 4)	0.04
Mean no. of sessions for obturation	1.6 $\pm$ 1	2.2 $\pm$ 1.5	0.03
Mortality	11% (n = 6)	3% (n = 1)	0.4

EHPVO: extrahepatic portal venous obstruction, EVL: endoscopic variceal ligation.

(*n* = 8) of cirrhotics as compared to 7% (*n* = 2) of EHPVO patients. GOV2 was present in 80% (*n* = 45) of cirrhotics as compared to 53% (*n* = 16) of EHPVO patients. IGV1 was seen in 40% (*n* = 12) of patients with EHPVO and in 4% (*n* = 2) cirrhotics. Of 53 patients with gastroesophageal varices in cirrhosis, 26 (50%) had undergone esophageal variceal eradication compared to 9 of 18 (50%) patients with gastroesophageal varices in EHPVO.

All the patients were treated with 156 injections (90 in cirrhotics; 66 in EHPVO) of NB (Table 2). The mean duration of follow up was 12 months (range 2–22 months). The mean volume of glue injected was 3.78 $\pm$ 2.58 ml over a median of 1 session (range: 1–8). The total volume of glue required in cirrhotics was 3.2 $\pm$ 2 ml and in EHPVO patients was 4.7 $\pm$ 3.1 ml and the difference was significant between the two groups (*p* = 0.01). The mean number of sessions required for obturation of gastric varices in cirrhotics was 1.6 $\pm$ 1 (range 1–4) and in EHPVO was 2.2 $\pm$ 1.5 (range 1–8) and this difference was significant (*p* = 0.03). Thirty-six percent (*n* = 20) of cirrhotics required >1 sessions of glue injection as compared to 57% (*n* = 17) of EHPVO patients. More than 2 ml of glue injection for GOV obturation was required in 60% (*n* = 12) of EHPVO as compared to 57% (*n* = 32) of cirrhotics. Rebleeding was seen in 9% (*n* = 5) of cirrhotics vs. 10% (*n* = 3) of EHPVO patients and this difference was not significant (*p* = 0.87). Over mean follow up period of 12 months, mortality (11% vs. 3%, *p* = 0.4) was similar in patients with cirrhosis and EHPVO. Causes of death were hepatorenal syndrome (*n* = 2), septicemia (*n* = 3) and upper gastrointestinal bleeding (*n* = 1) in

patients with cirrhosis and upper gastrointestinal bleeding (*n* = 1) in patients with EHPVO.

COMPLICATIONS OF *N*-BUTYL-2-CYANOACRYLATE TREATMENT

No clinically significant embolic complications attributed to NBC were noted during or after the procedure. There was no damage to the endoscopes.

DISCUSSION

Gastric varices and their association with portal hypertension were first described in 1931.¹⁴ The overall incidence of gastric varices in patients with portal hypertension is 18%–70%.^{1,2} GV are the source of 5%–10% of all upper digestive bleeding in patients with PHT.¹⁵

Accurate classification of gastric varices is essential in determining optimal management. The most widely used classification is that proposed by Sarin et al.³ Unlike esophageal varices, a high portosystemic pressure (>12 mmHg) does not cause gastric variceal bleeding, likely due to the high frequency of spontaneous gastrosplenic shunts.¹⁶ In one study, fundal varices had a significantly higher bleeding incidence (78% and 55% for IGV1 and GOV2, respectively) than either GOV1 or IGV2 (10%).³

In our study of 86 patients, GOV1 was present in 14% (*n* = 8) of cirrhotics as compared to 7% (*n* = 2) of patients with EHPVO, whereas GOV2 was present in 80% (*n* = 45) of cirrhotics as compared to 53% (*n* = 16) of patients with EHPVO. IGV1 was seen in 40% (*n* = 12) of patients with EHPVO and in 4% (*n* = 2) cirrhotics.

A variety of endoscopic, interventional radiologic, and surgical therapies have been used for the treatment of gastric variceal bleeding with variable success.¹⁷ Of these, transjugular intrahepatic portosystemic shunt (TIPS) is the one of the most commonly recommended procedures for acute gastric variceal bleeding. TIPS and NBC treatment have been shown to be equivalent in the control of acute bleeding, with a similar rate of rebleeding. Compared with NBC, TIPS has been associated with a higher rate of long-term morbidity requiring hospitalization because of an increased incidence of encephalopathy.¹⁸ Cost-effective analyses comparing NBC injection with TIPS have suggested that NBC is a safe and effective treatment for gastric variceal bleeding that can be provided at a significantly lower cost compared with TIPS placement.^{19,20} The usefulness of TIPS is also limited by its availability only in major centers.¹⁷ Balloon occluded retrograde transvenous obliteration has been used successfully for GV obliteration, primarily in Japan, as an elective procedure, but is unsuitable for acute gastric variceal bleeding and requires the presence of a spontaneous gastro-renal shunt.²¹

The preferred first line treatment for acute gastric variceal bleeding is endoscopic obliteration with NBC.^{20,22}

Endoscopic injection of tissue glue for gastric variceal bleeding was first reported in 1986 by Soehendra et al.¹² Since then, this method has been adopted widely and proved to be effective in the hemostasis of gastric variceal bleeding.^{23–28,30} NBC, a liquid monomer, undergoes rapid exothermic polymerization on contact with living tissues, and this property of the compound has been used to eradicate and treat GV. The relative efficacy of glue injection in the control of active gastric variceal bleed has been addressed in three randomized trials; it has been compared to sclerotherapy in one trial and variceal ligation in two.^{22,24} Two trials demonstrated better control of bleed with the use of glue injection as compared to sclerotherapy or variceal ligation (89% vs. 62% and 87% vs. 45%)²⁷; the third showed equivalent results as variceal ligation.²² Rebleed was significantly lower with glue injection when compared to variceal ligation (31% vs. 54%)^{22,28} and similar to sclerotherapy. Glue injection achieves variceal eradication in about 75% of patients (range: 50%–100%) with rebleed in 23%–50% of patients.⁸ It has been suggested that rebleed rates may be reduced with the use of endoscopic ultrasound guided glue injection.²⁴

Billi et al²⁷ conducted a 24-month follow up of 50 patients who underwent glue injections for gastric varices and reported that acute hemostasis was achieved in 92% of patients. Also Fuster et al²⁹ reported good results from glue use in pediatric patients. In this study, the success rate of acute hemostasis was 98.4%, comparable with other studies.^{22,30}

Though NBC has been used worldwide for the treatment for gastric varices, data regarding the long-term efficacy and safety of this procedure are still lacking. Indeed, although rare, fatal complications like systemic and pulmonary embolization do occur.^{22,28} Such events are especially commoner in those with large gastro-renal shunts and hepatopulmonary syndrome and caution is required with the use of glue in such patients.⁸ In our study there were no post glue complications.

In the present study, the mean volume of glue injected was 3.78 ± 2.58 ml over a median of 1 session (range: 1–8), the difference was significant between two groups. Thirty-six percent of cirrhotics required more than one session of glue injection as compared to 57% of EHPVO patients. More than 2 ml of glue injection for GOV obturation was required in 60% of EHPVO as compared to 57% of cirrhotics. Rebleeding rates were **similar** in the two groups. The rebleeding rate of 9–10% observed in this study was higher than that reported by D'Imperio et al³¹ (3.7%), similar to Dhiman et al³² (10.3%) but lower to those reported by Huang et al³³ (23.3%), Tan et al²² (27%) and Lee et al²⁴ (44.7%).

The role of postinjection radiography for detecting intra- or paravariceal injection or for visualizing variceal obliteration is questionable.³⁴ Simply probing the varix after individual injection is the simplest and most reliable method to confirm variceal obturation.¹⁸ Endoscopic

ultrasound is another useful modality to confirm obturation of gastric varices.

We conclude that, in patients with bleeding gastric varices GOV2 is significantly more common in cirrhotics as compared to patients with EHPVO and IGV1 is significantly more common in patients with EHPVO than in cirrhotics. The preferred endoscopic therapy for gastric variceal bleeding is injection of NBC. Patients with EHPVO **require** significantly higher total volume of glue and more glue sessions for gastric varix obturation. Rebleeding rates are similar in patients with EHPVO and cirrhosis. There were no post glue complications in either group.

CONFLICTS OF INTEREST

All authors have none to declare.

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