

## EFFECT OF BAND LIGATION ON PORTAL HYPERTENSIVE GASTROPATHY AND DEVELOPMENT OF FUNDAL VARICES

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**Background:** Use of endoscopic therapies for esophageal varices has resulted in increased prevalence of fundal varices and severe portal hypertensive gastropathy. This study was meant to compare the effect of band ligation and sclerotherapy on development of fundal varices and portal hypertensive gastropathy. **Methods:** Patients with esophageal varices presenting in the endoscopy unit of Shaikh Zayed Hospital, with at least one previous endoscopy were included. Patient's past record was reviewed for findings and type of treatment given for varices during first endoscopy, number of endoscopies till date, number of esophageal varices band ligation (EVBL) or sclerotherapy sessions. All patients underwent upper GI endoscopy and findings were recorded. Type of treatment patient rendered during first endoscopy either EVBL or sclerotherapy was correlated to the presence of fundal varices and severity of portal hypertensive gastropathy observed on present endoscopy, using Chi square test ( $\chi^2$ ). **Results:** Eighty one patients were included. Mean age of patients was  $48.70 \pm 12.63$ . Esophageal varices band ligation was carried out during first endoscopy in 49 (60.5%) patients and sclerotherapy in 31 (38.2%) patients. On fresh endoscopy, fundal varices were seen in 25 (30.8%) patients. Severe portal hypertensive gastropathy was found in 26 (32.1%) and mild in 54 (66.7%) patients. Severity of portal hypertensive gastropathy and presence of fundal varices in recent endoscopy was significantly more in patients with EVBL in first endoscopy. **Conclusion:** Band ligation of esophageal varices is associated with more frequent development of fundal varices and worsening of portal hypertensive gastropathy compared to sclerotherapy.

**Key Words:** Baveno scoring, Esophageal varices band ligation, Portal hypertensive gastropathy,

### INTRODUCTION

Portal hypertension is a major complication of chronic liver disease.<sup>1</sup> Portal hypertension develops in cirrhosis because of an increase in splanchnic blood flow secondary to vasodilatation within the splanchnic vascular bed and because of increased resistance to the passage of blood through the liver.<sup>2</sup> A clinical consequence, bleeding from ruptured gastro-esophageal varices is one of the major causes of death in patients with portal hypertension.<sup>3</sup> After varices have developed, one third of all patients die of bleeding gastro esophageal varices.<sup>4</sup> Apart from gastro-esophageal varices, these patients can also bleed from portal hypertensive gastropathy. In a study by Gupta *et al*, 61% of 230 patients with cirrhosis and esophageal varices had portal hypertensive gastropathy.<sup>3</sup> The mechanisms involved in the pathogenesis of portal hypertensive gastropathy have not been fully elucidated. However, regulation of gastric nitric oxide, prostaglandins, tumor necrosis factor  $\alpha$  (TNF- $\alpha$ ), and epidermal growth factor (EGF) production may be involved.<sup>5</sup>

Endoscopic therapeutic interventions like sclerotherapy and band ligation have changed the outlook for patients with upper GI bleeding. Sclerotherapy was the initial available modality that led to marked reduction in immediate mortality of cirrhosis due to upper GI bleeding. It is now

gradually being replaced by esophageal varices band ligation which has shown better results in terms of variceal obliteration and fewer side effects like ulceration, perforation and strictures formation than sclerotherapy.<sup>6</sup>

But with increasing use of EVBL and sclerotherapy for esophageal varices, incidence of fundal varices has increased. Few studies have shown that degree of portal hypertensive gastropathy has also shown worsening after introduction of therapeutic endoscopic interventions.<sup>7</sup> Which of the two therapies, EVBL or sclerotherapy is responsible for this is still far from being established.

In view of excellent results of band ligation as far as obliteration of esophageal varices is concerned, its effect on development of fundal varices and portal hypertensive gastropathy has raised concern among endoscopists. This study was planned to compare the effect of band ligation and sclerotherapy on development of fundal varices and portal hypertensive gastropathy.

### MATERIAL AND METHODS

This study was carried out in Endoscopy Unit of Department of Gastroenterology and Hepatology of Shaikh Zayed Post-Graduate Medical Institute Lahore from November 2003 to February 2004.

All patients with esophageal varices presenting for endoscopy with at least one previous

endoscopy in past were included in this study. Patient's past record was reviewed for duration and etiology of cirrhosis, Child score, reason for undergoing endoscopy, time since first endoscopy, findings in first endoscopy, number of endoscopies till date, number of band ligation sessions, number of sclerotherapy sessions and in case of complete disappearance of varices during follow up, time taken for sclerosis of varices and appearance of fundal varices during follow up endoscopies.

All these patients underwent upper GI endoscopy to look for presence and degree of esophageal varices. All endoscopies were performed in a single endoscopy unit using an Olympus video endoscope GIF 160. Esophageal varices were classified according to a uniform criteria. Briefly, esophageal varices were classified as small or large, where small esophageal varices were defined as varices that flatten with insufflation or minimally protrude into the esophageal lumen, while large esophageal varices were defined as varices that protrude into the esophageal lumen and touch each other (presence of confluence), or that fill at least 50% of the esophageal lumen.<sup>11</sup> This simple classification is considered the preferred classification by a recent consensus conference on portal hypertension held in Baveno, Italy.<sup>12</sup> In some cases, endoscopists used the grade (I-IV) classification.<sup>13</sup> when grades I through IV were used, grades I and II were reclassified as small and grades III and IV were reclassified as large for this study. Fundal varices were also noted. Portal hypertensive gastropathy was classified using Baveno scoring system as given in table 1.

**Table-1: Baveno scoring system for portal hypertensive gastropathy**

Endoscopic appearance	Baveno score
Mucosal mosaic pattern	
Mild	1
Severe	2
Red markings	
Isolated	1
Confluent	2
Gastric antral vascular ectasia	
Absent	0
Present	2
Banevo - 3 or less = Mild PHG Score 4 or more = Severe PHG	6 (Maximum score)

Statistical analysis was performed using a software package (SPSS 10.0.1; SPSS Inc, 1989-1999 Chicago, Ill). Results were expressed as mean  $\pm$  SD. Each continuous parameter between the two groups, patients with sclerotherapy and patients with band ligation in first endoscopy, was analyzed with student's 't' test. Categorical data was examined using the chi square  $\chi^2$  test. Type of endoscopic therapy of varices in first endoscopy was correlated with presence of fundal varices at latest endoscopy

and severity of portal hypertensive gastropathy according to Baveno scoring system using chi square  $\chi^2$  test. 95% confidence interval (CI) of their differences was considered significant. Cross tabulation was used for identification of exact distribution.

## RESULTS

Data of 81 patients was recorded. 21 (25.9%) were females and 60 (74.1%) males. Mean age of patients was 48.70 ( $\pm$  12.63). Seventy six (93.8%) patients were suffering from cirrhosis due to hepatitis C, 2 (2.5%) had hepatitis B and cause of cirrhosis was not known in 3 (3.7%) patients. Mean Child Pugh score was 6.59 ( $\pm$  1.31). Forty four (54.3%) patients belonged to Child class A, 35 (43.2%) to child class B and 2 (2.5%) patients were in Child class C. Secondary prophylaxis was the reason for follow up endoscopy in 74 (91.4%) patients, whereas 7 (8.6%) patients were brought to endoscopy unit following acute episode of upper GI bleeding. Mean number of endoscopy sessions for these patients were 6.64 with maximum of 24. Mean duration since first endoscopy was 18.73 months with maximum of 120 months. High grade varices were seen in 67 (82.8%) patients while low grade varices were noted in 13 (16%) patients on first endoscopy. Fundal varices were present in 8 (10%) patients at first endoscopy while one patient had isolated fundal varix. Portal hypertensive gastropathy was mild in 78 (96%) patients and only 3 patients had severe portal hypertensive gastropathy. For esophageal varices band ligation was carried out at time of first endoscopy in 49 (60.5%) patients and sclerotherapy was done in 31 (38.2%) patients. For gastric varices 7 (8.6%) patients had histoacryl injection. Thirty one (38.2%) patients with sclerotherapy in first endoscopy were only followed by sessions of sclerotherapy while 42 (86%) with EVBL on first endoscopy later had band ligation only. Rest of 7 (14%) patients had band ligation sessions initially till they were left with small varices which were sclerosed with alcohol injection.

On latest endoscopy, 19 (23.4%) patients still had high grade varices and 49 (60.5%) patients had low grade varices. Varices were completely sclerosed in 13 (16%) patients. Fundal varices were seen in 25 (30.8%) patients with predominant gastro-esophageal varix type II (GOV-II) in 16 (64%) patients. Portal hypertensive gastropathy was assessed for severity using Baveno scoring system. Mean score was 2.63  $\pm$  1.46 with maximum of 6. Severe portal hypertensive gastropathy was found in 26 (32.1%) and mild in 54 (66.7%) patients. No gastropathy was noted in 1 (1.2%) patient.

Type of endoscopic therapy given in first endoscopy was found to have significant correlation with the severity of portal hypertensive gastropathy (p 0.036) on recent endoscopy. Distribution of severity of portal hypertensive gastropathy in patients with band ligation and those with sclerotherapy was as given in Table 2.

On fresh endoscopy, 25 patients were found to have fundal varices. When presence of fundal varices was checked for its association with type of endoscopic treatment on first endoscopy, it was found to be significant (p 0.002). When this association was cross tabulated, 19 (38.7%) patients out of 49 with EVBL and 6 (19.3%) of 31 with sclerotherapy on first endoscopy had fundal varices. (Figure-1)

Patient with band ligation as first choice therapy for esophageal varices developed significantly more fundal varices and severe portal hypertensive gastropathy than those treated with sclerotherapy in their first endoscopy.

**Table-2: Correlation of severity of portal hypertensive gastropathy with treatment in first endoscopy**

Treatment in first endoscopy	Severity of portal hypertensive gastropathy in recent endoscopy			Total
	Absent	Mild	Severe	
Sclerotherapy	1	22	8	31
Band ligation	-	31	18	49
Histoacryl injection	-	1	-	1
Total	1	54	26	81

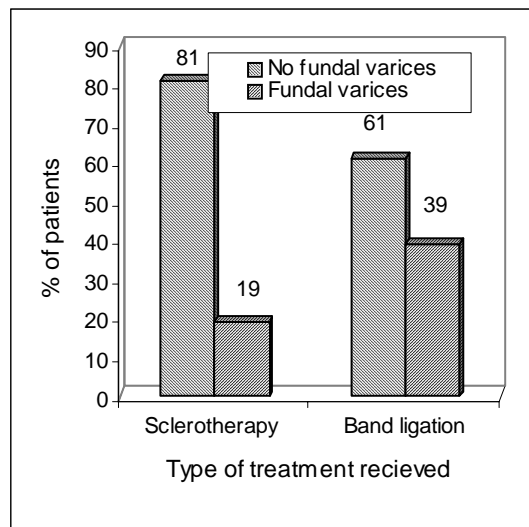
**DISCUSSION**

Bleeding esophago-gastric varices is among the most dreadful complications of cirrhosis. The risk of initial bleeding from varices is 25% to 35% in 2 years, with most first-bleeding episodes occurring within a year of detection of varices.<sup>8</sup>

Following the increasing use of sclerotherapy and banding in the 1980s and 1990s, studies began to report an association between the endoscopic treatment of varices and the development of portal hypertensive gastropathy and fundal varices.

There are studies which show that sclerotherapy can lead to worsening of portal hypertensive gastropathy. One such study by Sarin SK *et al* found that over a 52 month follow up period, portal hypertensive gastropathy increased dramatically following sclerotherapy.<sup>9</sup> Another study by Gupta *et al* showed a marked increase in portal hypertensive gastropathy during a two year follow up period after sclerotherapy.<sup>2</sup> Of those patients that required sclerotherapy, portal hypertensive gastropathy was present in 33% of patients prior to sclerotherapy compared with 79% following sclerotherapy. Another study had almost same

results.<sup>10</sup> In this study, 95 patients were treated with either sclerotherapy or band ligation, with similar rates of success in arresting acute bleeding. The banding group required fewer sessions for obliteration, furthermore rebleeding and complication rates were higher in the sclerotherapy treated group. However, the variceal recurrence rate was higher in those patients treated with ligation, and the development of portal hypertensive gastropathy was almost 10-fold higher in patients treated with sclerotherapy versus banding (20.5% v 2.3%).<sup>10</sup> Study from Sarin SK *et al*<sup>6</sup> compared sclerotherapy and band ligation and concluded that (i) Endoscopic sclerotherapy and endoscopic variceal ligation were equally effective in controlling acute bleed; (ii) endoscopic ligation achieved variceal obliteration faster and in fewer treatment sessions; (iii) endoscopic variceal ligation had a significantly lower rate of development of portal gastropathy and rebleeding, (iv) while both techniques influenced gastric varices equally, there was significantly higher esophageal variceal recurrence after endoscopic variceal ligation than sclerotherapy.<sup>6</sup> - De BK, Ghoshal UC *et al* also concluded that sclerotherapy results in worsening of portal hypertensive gastropathy and fundal varices.<sup>11</sup>



**Figure-1: Appearance of fundal varices with therapeutic endoscopy for esophageal varices**

We in our study, contrary to above mentioned studies, have found band ligation to be responsible for development of fundal varices and worsening of portal hypertensive gastropathy. Few studies in recent past have witnessed similar results. One such study included 88 cirrhotic patients receiving either sclerotherapy or band ligation.<sup>7</sup> Band ligation resulted in a greater reduction in bleeding and fewer complications. However, there was a greater incidence of variceal recurrence and a greater

increase in the severity of portal hypertensive gastropathy in the banding group compared with those patients treated with sclerotherapy.<sup>7</sup> According to Misra SP et al obliteration of esophageal varices following endoscopic variceal band ligation results in an increase in the incidence of portal hypertensive gastropathy.<sup>12</sup> Lo GH et al found that band ligation results in worsening of portal hypertensive gastropathy.<sup>13</sup>

It may be due to altered hemodynamics following band ligation.<sup>14</sup> Kanke K et al concluded that gastric mucosal hemodynamics showed increment of the gastric blood volume and decreased hemoglobin O<sub>2</sub> saturation in cirrhotic patients, indicating that cirrhotic gastric mucosa is in congestive condition.<sup>14</sup> Esophageal variceal ligation makes the gastric mucosa more congestive soon after the procedure.<sup>15,16</sup> Korula J et al concluded that after variceal obliteration there is increase in portal pressure gradient.<sup>17</sup> This increase pressure is transformed in worsening of portal hypertensive gastropathy and development of fundal varices. But there are reports that despite worsening of portal hypertensive gastropathy and development of fundal varices, there is no change in portal pressure with either sclerotherapy or band ligation.<sup>18</sup>

Why lesser number of patients with sclerotherapy developed fundal varices and severe portal hypertensive gastropathy, is the question still unanswered. It will need hemodynamic studies of portal pressure in these patients after repeated sessions of endoscopic therapy.

In this study we were confronted with few limitations. Seven (14%) of our patients with band ligation at first session did have few sessions of sclerotherapy later which can confound our results. But these sessions of sclerotherapy were carried out once the size of varices was too small to apply bands. Secondly, follow up time for these patients had varied from two weeks to ten years. These confounding factors can only be eliminated in prospectively planned study.

## CONCLUSION

Band ligation of esophageal varices was associated with more frequent development of fundal varices and worsening of portal hypertensive gastropathy compared to sclerotherapy in retrospective study.

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