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Original article

Efficacy of Endoscopic Band Ligation versus Argon Plasma Coagulation in Gastric Antral Vascular Ectasia Management

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Abstract

Background: Gastric Antral Vascular Ectasia (GAVE) is a capillary-type vascular malformation located mainly in the gastric antrum. It is characterized by dilated, tortuous mucosal capillaries and submucosal veins. **Aim of the work:** to evaluate the therapeutic effects of Endoscopic Band Ligation (EBL) for the treatment of bleeding from GAVE in comparison to Argon Plasma Coagulation (APC). **Patients and Methods:** This prospective randomized study was conducted on fifty patients presenting with Upper Gastro Intestinal Bleeding (UGIB) that proved by Gastro Duodenoscopy to be originating from GAVE at Kafr El Sheikh liver center every Tuesday weekly in the period from December 2019 to December 2020. Informed consent was obtained from each patient. **Results:** In this study hemoglobin levels were significantly raised after each endoscopic session done monthly through three months/four endoscopic follow up sessions in patients who underwent EBL and APC with no significant difference between both. Also, recurrence of bleeding from GAVE was significantly decreasing during follow up period in both groups with non-significant difference between both groups. Both groups showed non-significant mild complications like superficial ulcers and gastric hyperplastic polyps with non-significant difference between both. Duodenoscopy follow up after 3 months of treatment showed marked improvement in patients treated with EBL and APC. two patients in each group showed incomplete eradication of GAVE at fourth endoscopic follow up session requiring further follow up. Single patient showed recurrence of GAVE in EBL group with no recurrences in APC group. **Conclusion:** both APC and EBL are safe and effective management options for both punctate and watermelon types of GAVE.

Key words: endoscopic band ligation, argon plasma coagulation, Gastric Antral Vascular Ectasia

Introduction

Watermelon stomach, also known as gastric antral vascular ectasia (GAVE), is distinguished endoscopically by parallel red strips, angiomatous lesions at antral mucosal folds that resemble watermelon strips. [(1)] It can arise on its own or in conjunction with other diseases such as systemic sclerosis and cirrhosis. [(2)] Renal failure, bone marrow transplantation, and scleroderma have all been linked to it. [(3)] The etiology of GAVE is still unknown. However, several mechanisms have been supposed for the development of GAVE.

Altered antrum motility and dysfunction inducing chronic mucosal trauma and subsequent sub mucosal fibro muscular hyperplasia and dilatation of mucosal vessels are the main contributing factors.[(1)] GAVE is characterized by a pathognomonic endoscopic pattern, mainly represented by red spots either organized in stripes radially departing from pylorus, or arranged in a diffuse way, which is called honeycomb stomach. [(4)] Many treatment approaches, including surgical, endoscopic, and medicinal options, have been presented, but the optimum method has yet to be determined. [(4)] GAVE hemorrhage has been controlled by a variety of medicinal approaches. However, the majority of them were confined to case studies, and the long-term efficacy and safety of medical therapy are the most key aspects to consider. [(1)] The estrogen and progesterone combination, which was borrowed from its therapy of HHT, was proven to halt bleeding in six GAVE patients. Thalidomide and serotonin reuptake inhibitors have also been tried, although their evidence is equally limited. [(5)] Cryotherapy, neodymium-yttrium-aluminum garner laser coagulation (Nd:YAG) laser, Argon plasma coagulation (APC), Endoscopic band ligation (EBL), and radiofrequency are some of the endoscopic techniques used to treat GAVE. [(1)] This study was conducted to compare and determine the outcome and success of argon plasma coagulation (APC) and endoscopic band ligation (EBL) in the control of bleeding and prevention of recurrence of bleeding related to Gastric Antral Vascular Ectasia (GAVE) and also asses number of sessions required by each maneuver to eliminate GAVE.

Patients and methods

Prospective randomized study was conducted on 50 patients presented with upper GIT bleeding proved by upper EGD to be originated from GAVE, presented to Kafr El Sheikh Liver Center every Tuesday weekly in the period from December 2019 to December 2020. The study protocol was

approved by the ethical committee of Benha University Hospitals, Benha University (MS2392019). An informed written consent was obtained from all patients participating in this study after explaining the study measures in details.

Patients were divided into two groups:

APC group: 25 patients with GAVE treated with argon plasma coagulation (APC)

EBL group: 25 patients with GAVE banded by rubber bands applied by endoscopic applicator.

Inclusion criteria:

Patients ≥ 18 years presented with obvious or occult blood loss from GAVE as a source of bleeding diagnosed by upper GIT endoscopy either diffuse or watermelon type localized to the antrum of stomach.

Exclusion criteria applied to all:

- Patients with bleeding peptic ulcers, bleeding esophageal or gastric varices or any other active source of bleeding identified endoscopically other than GAVE.
- Patients with Hemorrhagic blood diseases.
- Patients with lymphoproliferative disorders.
- Patients with advanced malignancy.
- Patients with hemorrhagic PHG.

Each patient included was subjected to the following: History taking: Including age, sex, type of bleeding, and presence of chronic liver disease and other medical or previous surgical history.

Complete physical examination which included General examination*:* with emphasis on stigmata of chronic liver disease.

Local abdominal examination:

For organomegaly and presence of ascites.

Laboratory investigations:

Complete blood count (CBC) before and every month follow up for 3 months. Liver function tests (ALT, AST, bilirubin, albumin, INR), HCV antibody and HBsAg before UGI endoscopic treatment.

Abdominal ultrasound (US):

To state the condition of liver for presence of cirrhotic signs or not, which include:

- Nodular liver surface.
- Coarse echo pattern.
- Hypertrophy of the left and caudate lobes.
- Splenomegaly.
- Presence of porto-systemic collaterals.
- Minimal perihepatic ascites.

Anyone who fulfill inclusion criteria was informed about this study and informed consent obtained, followed monthly for 3 months by measuring hemoglobin level to assess improvement of anemia and UGI endoscopy for GAVE outcome and complication of each procedure if any.

Patients who quit follow up or refused were excluded.

Upper GIT Endoscopy: After complete clinical, laboratory and sonographic upper endoscopy was done under general anesthesia.

APC technique: In this study, standard APC equipment was used, consisting of a high-frequency electrosurgical generator (ICC 350; ERBE, Germany), an automatically regulated argon source (APC 300) and a flexible APC probe. The APC probe was a 2.3 mm Teflon-coated catheter with a thermo-resistant ceramic top, which could be passed through the working channel of an endoscope. Electrical power was 60 W and argon gas flow was 2 L/min. APC was applied to the lesion beginning at the pylorus and proceeding proximally. a foot pedal was used to control application time for coagulation till blanching of targeted mucosal spots or lines of GAVE [(3)]

Band ligation technique: EBL was done by boston scientific 6 shots band ligation sets which were applied to abnormal GAVE mucosa started in the gastric antrum with subsequent proximal ligation proximal until abnormal appearance of mucosa affected by GAVE fades away. [(3)]

Follow up:

Follow up is arranged as monthly interval visits for three months at which patients evaluation and hemodynamic resuscitation for clinically unstable patients, general condition evaluated and asked for post procedure drawbacks, recurrence of melena or hematemesis and next session endoscopy done to evaluate outcome of GAVE, appearance of complication.

Results

A total number of fifty (50) patients with female predominance (20 male and 30 female) presented by UGIB owing to GAVE were enrolled in this study, twenty-five (25) patients were treated by argon plasma coagulation (APC) categorized as Group I and 25 patients treated by Endoscopic band ligation (EBL) group II, the mean age was 56.44 in group I and 58.32 in group II, according to sex there were 9 males and 16 females in group I and 11 males and 14 females in group II with no significance between both groups as shown in table (1). There was no statistical significance between both groups according to previous medication history which include PPIs (2 patients in each group), NSAIDs (2 patients in group I and 1 patient in group II) and B Blockers (1 patient in group I and 2 patients in group II). abdominal ultrasound finding before treatment was insignificant between both groups as the liver pattern was bright in 7 patients and 18 patients showed cirrhotic

signs in group I and in group II 5 patients had bright liver pattern and 15 patients showed cirrhotic sings, the median spleen diameter was 11cm in group I and 12cm in as the median HB% was 9.5mg/dl in group 1 and 9.6gm/dl in group II, mean platelet count ($x10^3$/ul) was 170.20 1n group I and 155.76 in group II, mean WBCs($x10^6$/l) was 5.926 in group I and 5.869 in group II also liver function tests was statistically non-significant between both groups as median ALT (u/l)was 20 in group I and 17 in group II, median AST (u/l) was 27 in group I and 23 in group II, median total serum bilirubin(mg/dl) was 1 in group I and 1.2 in group II, median serum albumin(mg/dl) was 3.9 in group I and 3.8 in group II, mean INR was 1.13 in group I and 1.18 in group II. hepatitis viruses were statistically non-significant between both groups as HCVAB was positive in 17 patents in group I and 19 patients in group II and HBsAg was positive in 2 patients in group I and 3 patients in group II. The endoscopic findings in both groups in the first endoscopic session was statistically non-significant as shown in table (2) including type of GAVE fig (1).

As shown in table (3), through three months follow up period there was increase in the HB% in both groups as in group I HB% increased from median 9.5 gm/dl at the start to 11.6 gm/dl after 3months which was statistically significant (**p value=<0.001**) group II and the median portal vein diameter was 10mm in group I and 11mm in group II. Pre intervention laboratory investigation was insignificant between group I and group II and in group II HB% increased from median9.6 gm/dl at the start to 11.4 gm/dl after three months which was statistically significant (**p value= <0.001**) but comparing both groups according to improvement in HB% at each month was statistically non-significant (**p value = >0.05**). also, the endoscopic appearance of GAVE has significantly improved during follow up in group I and group II from first endoscopic session to third session (**p value= <0.001**) but comparing both groups according to improvement of GAVE by endoscopic appearance at each month was statistically non-significant (**p value >0.05**),recurrence of bleeding from GAVE decreased significantly during follow up in group I from 5 cases after first month to no one after third month **(p value =0.030)** and from six cases after first month to no one after third month in group II **(p value=0.032)** but comparing both groups was statistically non-significant **(p value >0.05).**

Also, complications in both groups was statistically non-significant by the end of follow up and in the form of small sessile polyps and superficial ulcers. The net outcome of treatment of GAVE during three months as shown in table (4) showed non-

significant difference between both groups as in group I 23 patients (92%) showed complete resolution of GAVE, 2 patients(8%) required further endoscopic sessions and in group II 22 patients (88%) showed complete resolution of GAVE,2 patients (8%) required further treatment sessions and one case(4%) had GAVE recurrence. There was no significant difference in both groups according to GAVE outcome in relation to either cirrhotic or non-cirrhotic patients as in group I (cirrhotic 18 /non cirrhotic 7 patients) p value =0.490 and in group II (cirrhotic 20/ non cirrhotic 5 patients) p value =1.000.

Table (1): Comparison between the studied groups according to age and sex:

	Group I (APC) (n = 25)		Group II (EBL) (n = 25)		Test of Sig.	P
Sex	No.	%	No.	%		
Male	9	36.0	11	44.0	χ^2= 0.333	0.564
Female	16	64.0	14	56.0		
Age (years)						
Min. – Max.	44.0 – 73.0		45.0 – 72.0		t= 0.952	0.346
Mean ± SD.	56.44 ± 7.05		58.32 ± 6.91			
Median(IQR)	55.0(54.0 – 62.0)		60.0(54.0 – 62.0)			

χ2: Chi square test, FE: Fisher Exact, t: Student t-test, p: p value for comparing between the studied groups.

Table (2): Comparison between the studied groups according to endoscopic findings at first session.

Endoscopic findings at the start	Group I (APC) (n = 25)		Group II (EBL) (n = 25)		χ^2	p
	No.	%	No.	%		
Type of GAVE						
Watermelon type GAVE	22	88.0	22	88.0	0.0	FE/ p= 1.000
Diffuse honeycomb type	3	12.0	3	12.0		
Osophgeal varices (Ovs)						
No	6	24.0	3	12.0		
Small (G I)	13	52.0	12	48.0	2.945	MC/ p= 0.432
Medium (G II-III)	6	24.0	8	32.0		
Large Non risky (G IV)	0	0.0	2	8.0		
Gastroesophageal varices (extensions) (GOVs)						
Absent	23	92.0	23	92.0		FE/ p= 1.000
Present	2	8.0	2	8.0	0.0	
Isolated gastric varices						
Absent	23	92.0	18	72.0		FE/ p=
Present	2	8.0	7	28.0	3.388	0.138
PHG (mild severity)						
Absent	17	68.0	13	52.0	1.333	0.248
Present	8	32.0	12	48.0		
Other endoscopic findings						
No	24	96.0	23	92.0	0.355	FE/ p= 1.000
Yes	1	4.0	2	8.0		

χ^2: Chi square test, FE: Fisher Exact, MC: Monte Carlo, p: p value for comparing between the studied groups.
other endoscopic findings which include one case of gastric polyp and one case of esophageal web in APC group and one case of gastric polyp in EBL group.

Table (3) follow up endoscopic sessions and percentage of HB change:

	Follow up	Group I (APC) (n = 25)		Group II (EBL) (n = 25)		Test of Sig.	p
		No.	%	No.	%		
After 1 month	**HB % (g/dl)**						
	Min. – Max.	8.90 – 11.60		8.10 – 11.0		t= 0.309	0.759
	Mean ± SD.	10.27 ± 0.72		10.21 ± 0.74			
	Median (IQR)	10.30(9.70 – 10.80)		10.30(10.0-10.80)			
	GAVE						
	No improvement	3	12.0	1	4.0	χ^2= 2.244	MC/p= 0.320
	Incomplete improvement	19	76.0	23	92.0		
	Completely improved (resolved)	3	12.0	1	4.0		
	Recurrence of bleeding						
	No	20	80.0	19	76.0	χ^2= 0.117	0.733
	Yes	5	20.0	6	24.0		
	Complication						
	No	21	84.0	20	80.0	χ^2=1.469	MC/p= 0.701
	Polyps	1	4.0	0	0.0		
	Ulcers	3	12.0	5	20.0		
After 2 months	**HB % (g/dl)**						
	Min. – Max.	9.0 – 12.0		8.30 – 12.0		t= 0.458	0.649
	Mean ± SD.	10.90 ± 0.74		10.79 ± 0.92			
	Median (IQR)	11.0(10.30 – 11.30)		10.90(10.50 – 11.40)			
	GAVE						
	No improvement	0	0.0	1	4.0	χ^2= 1.957	MC/p= 0.369
	Incomplete improvement	7	28.0	10	40.0		
	Completely improved (resolved)	18	72.0	14	56.0		
	Recurrence of bleeding						
	No	24	96.0	20	80.0	χ^2= 3.030	FE/p= 0.189
	Yes	1	4.0	5	20.0		
	Complication						
	No	22	88.0	21	84.0	χ^2= 0.531	MC/p= 1.000
	Polyps	1	4.0	1	4.0		
	Ulcers	2	8.0	3	12.0		
After 3 months	**HB % (g/dl)**						
	Min. – Max.	9.90 – 12.20		9.50 – 12.40		t= 0.448	0.656
	Mean ± SD.	11.46 ± 0.62		11.38 ± 0.65			
	Median (IQR)	11.60(11.20 – 11.90)		11.40(11.0 – 11.80)			
	GAVE						
	No improvement	0	0.0	1	4.0	χ^2= 1.081	MC/p= 1.000
	Incomplete improvement	2	8.0	2	8.0		
	Completely improved (resolved)	23	92.0	22	88.0		
	Recurrence of bleeding						
	No	25	100.0	25	100.0	-	-
	Yes	0	0.0	0	0.0		
	Complication						
	No	23	92.0	23	92.0	χ^2= 0.0	MC/p= 1.000
	Polyps	1	4.0	1	4.0		
	Ulcers	1	4.0	1	4.0		

χ^2: Chi square test, MC: Monte Carlo, t: Student t-test, p: p value for comparing between the studied groups

Table (4): Comparison between the studied groups according to Outcome of treatment after 3 Months (4 endoscopic sessions).

Outcome of treatment after 3 Months (4 endoscopic sessions)	Group I (APC) (n = 25)		Group II (EBL) (n = 25)		Test of Sig.	p
	No.	%	No.	%		
Completely resolved	23	92.0	22	88.0		
In complete resolution (require more sessions)	2	8.0	2	8.0	χ^2= 1.081	MC/p= 1.000
Recurrence of GAVE	0	0.0	1	4.0		

χ^2: Chi square test, MC: Monte Carlo, p: p value for comparing between the studied groups.

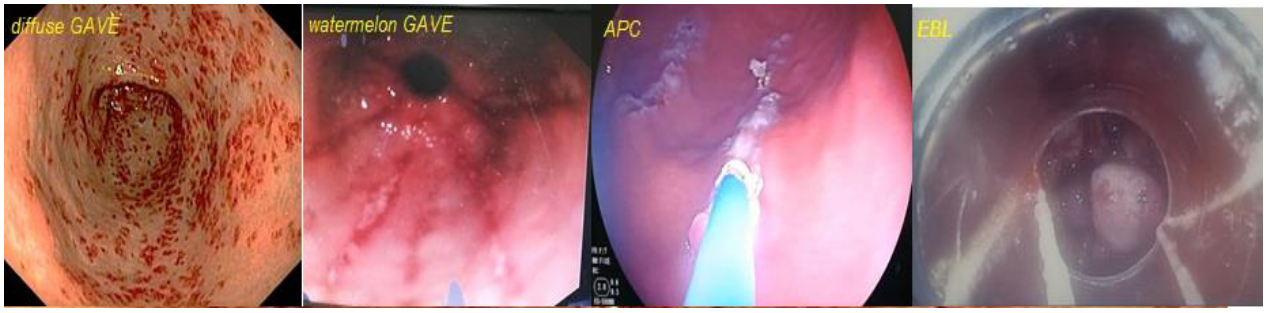

Fig. (1): types of GAVE and endoscopic techniques.

Discussion

One of the most common emergencies seen by general practitioners is upper gastrointestinal hemorrhage. Its yearly incidence is predicted to be 50 to 150 per 100 000 people. Therapeutic endoscopy is critical in controlling and arresting bleeding once hemodynamic stability has been attained. [6]

GAVE is a rare but serious etiology of non-variceal upper gastrointestinal hemorrhage, accounting for around 4% of all cases. It can appear either alone or in conjunction with a number of diseases, the most common of which being systemic sclerosis and cirrhosis. GAVE bleeding may be hard to treat and need long-term blood transfusions. GAVE is characterized by ectatic mucosal blood vessels, which most often occur in the stomach antrum and are associated with indolent bleeding and anemia due to iron deficiency. [2]

Unlike PHG, GAVE does not have a PH-related etiology. Without the underlying mosaic pattern found in PHG, GAVE appear as flat red dots. The red spots may unite and form stripes merging into the pylorus, which has led to the term “watermelon stomach.” The histology of the stomach mucosa is characterized by capillary and venule dilatation, submucosa with intimal thickening, spindle cell proliferation, fibrohyalinosis, and thrombi. [7]

A multimodal strategy is required for the management of acute UGIB bleeding, which

includes assessment and resuscitation, blood transfusion, the use of vasoactive medications, and the execution of early diagnostic and therapeutic endoscopy. Endoscopic treatment techniques such as argon plasma coagulation (APC), heater probe, cryotherapy, band ligation, and laser therapy have all been employed in the setting of GAVE. [8]

In this study, 50 patients with UGIB due to GAVE were divided into two equal groups each has 25 patients managed by APC and EBL. Their past medical history includes DM, HTN and liver cirrhosis. drug history, PPIs, NSAIDs and beta blockers (BBs). Their past surgical history includes splenectomy in 4 patients in APC group and single case in EBL group. These results were statistically non-significant between two groups.

According to age, in the present study the mean age was 56.44 years (44-73) in APC group and 58.32 years (45-72) in EBL group with female predominance (female: male = 3: 2) in the two groups. Various studies showed different age group ranges but with great agreement that GAVE is more common in adulthood and elderly population. In the study done in 2013 it comprised 23 patients with GAVE, mean age was 73.9 (55–89) years with male to female ratio (2.38: 1) [9] In another study done in 2009, comprised 20 patients with GAVE aging from 45 to 81 years with female to male ratio was (1: 1.86). [10] A research studied 40 cirrhotic patients with GAVE with mean age 55 years with nearly equal female to male ratio (1.1: 1). [11]

As regard clinical presentation, in the current study there were 38 out of 50 patients (76%) presented with overt GIT bleeding (hematemesis or melena) and 12 patients (24%) with iron deficiency anemia (+ve FOBT). This finding comes in partial agreement with a study that revealed that 27 out of 40 cirrhotic patients 67.5% had overt bleeding and 32.5% with iron deficiency anemia (IDA). [11] Thirty four, patients with GAVE presented with IDA of them 61.76% had overt GIT bleeding. [3] However, 20 patients with GAVE (80% presented with IDA and only 20% with overt GIT bleeding) which disagree with the current study findings. [10]

In the present study 80% (20/25) in EBL group and 72% (18/25) in APC group were cirrhotic patients which agrees with a study done in 2019, which found that 29 patients (80.6%) presented with acute overt blood loss of 36 total cirrhotic patients. [12]

Laboratory workup done pre intervention included; liver profile, complete blood picture, all these points of comparison in laboratory workup not reach statistically significant difference between two groups and were greatly similar a previous study done in 2013 [13]

According to viral hepatitis, 17 patients (68%) in APC group and 19 (76%) patients in EBL group were positive for HCV which was the main underlying cause of cirrhosis in both groups and 2 patients (8%) in APC group and 3 patients (12%) in EBL group were positive for HBV with non-statistical significant difference between both groups as regard viral hepatitis. These findings agree with previous results of a study that found that 30 patients out of 36 (83.3%) were positive for HCV and it was the underlying Cause of cirrhosis in the majority of cases. **(12)**

Regarding **spleen diameter** there was non-significant difference between both groups as the mean was 12.76 ± 3.18 in APC group and 13.08 ± 2.58 in EBL group. Also, the mean portal vein diameter was 10.56 ± 1.56 in APC group and 10.76 ± 1.42 in EBL group which was statistically non-significant.

These finding agrees with many previous studies (14 & 12) as presence or absence of GAVE has no relation to portal hypertension or spleen size. Also, these findings agree with what was reported that the frequent presence of GAVE in the absence of portal hypertension or enlarged spleen beside that, there were more than 70% of patients with GAVE syndrome do not have cirrhosis or portal hypertension. **(15)**

Endoscopic findings other than GAVE were reported and included; small to medium size non risky esophageal varices (OVs) in (19 in APC group and 20 patients in EBL group), 2 patients with large non risky OVs in EBL group, non-risky Gastroesophageal varices (extensions) (GOVs) in 2 patients in both groups, Isolated gastric varices in (2 in APC group and 7 patients in EBL group) and PHG in (8 in APC group and 12 patients in EBL group), when comparing these findings between two groups (APC and EBL) did not reach significant difference. In a similar study found that in EBL group there were OVs (Grade I in 3, Grade II in 7, Grade III in 3, Grade IV in 3 cases and no OVs in 28 cases) and in APC group there were OVs (Grade I in 2, Grade II in 7, Grade III in 6, Grade IV in 3 cases and no OVs in 26 cases), findings that were non-significant statistically between both groups. **(16)**

In this study there was a significant increase in mean HB% with serial follow up done monthly (from 9.47g/dl before intervention to 10.27 after 1st month to 10.90 after 2nd month to 11.46 g/dl after 3rd month/ fourth endoscopic session) in APC group and (from 9.45 g/dl before treatment to 10.21 after 1st month to 10.79 after 2nd month to 11.38 g/dl after 3rd month/ fourth endoscopic session) in EBL group, hemoglobin improvement was achieved in both groups but there was no statistical significant difference in percentage of change of hemoglobin

between both groups (APC and EBL). Also, in either APC group or EBL group there was no statistically significance relation between degrees of HB% improvement liver pattern (cirrhotic/non-cirrhotic). These findings agree with the study done on 40 cirrhotic patients and recorded no statistically significant difference between both APC and EBL in management of GAVE according to improvement in HB%. **(12 & 16)**

According to **endoscopic improvement of GAVE** in serial follow up sessions in this study there was significant improvement in each group with no significantly statistical significance between both groups as by the forth endoscopic session there was 92% complete resolution of GAVE in APC group (23/25 patients) and 88% in EBL group (22/25 patients) P value ≥ 0.05 with slight non-significant superiority favors APC outcome. also, we decided a **fixed number of endoscopic follow up sessions (four)** with longer intersessions interval (four weeks) with a total 3 months study period as many previous studies have controversies in mean number of follow up sessions and intervals between sessions till GAVE heals either by APC or EBL therapy.

Besides, the study was concerned with **watermelon (classic) type GAVE** as each group included 22 out of 25 patients 88%. However, in a retrospective study done on 34 **cirrhotic** patients with 22 treated by APC and 12 treated by EBL and all cases were of **diffuse** type GAVE, endoscopic follow up was carried out **weekly** with mean number of sessions (2.3 in APC group and 3 in EBL group) and all cases showed resolution of GAVE in both groups. **(3)** Also, in a prospective study on 40 **cirrhotic** Egyptian patients compared EBL (20 patient) 15 of them **were with diffuse** type gave) and APC (20 patient) **17** of them were **with diffuse type** GAVE), Patients in both groups were revised **every 3 weeks** till improvement of GAVE. Treatment of GAVE by EBL had required significantly fewer treatment sessions with the **mean number of 2.25 ± 0.64**compared to APC with the mean number of **5.5 ± 3.76**. **(11)** In another a prospective randomized trial on larger number (**88**) **cirrhotic** patients with GAVE comparing EBL with APC allocating 44 patients in each group and endoscopic follow up was done **every two weeks** till obliteration of GAVE.

The number of treatment sessions in the EBL group had a **mean of 2.93±0.846**; while in the APC group, the number of treatment sessions had a **mean of 3.48±0.902** also their study didn't mention type of GAVE treated. **(16)** Furthermore, **a** researcher, studied 20 patients with GAVE induced UGIB and divided them into two groups 10 in each group treated by APC and EBL, with liver cirrhosis present in 40% of

APC group and 30% in EBL group, also diffuse honey comb type GAVE present in 30 % of each group, the mean number of treatment sessions was 5.4 ± 1.5 in APC group versus 2.9 ± 0.9 in EBL group his study didn't comment on intersessions interval or how long was the follow up period besides the small sample of the studied group. **(13)**

Regarding **recurrence of bleeding**, the current study showed that after 1st month 5 /25 in APC group and 6/25 in EBL group had recurrence, by 2nd month 1/25 in APC and 5/ 25 in EBL and by the 3rd month there was no recurrence in either groups which shows non-significant superiority in APC group as regard recurrence of bleeding from GAVE. However, these results disagree with **other study** as during the follow-up period, the APC group showed a significantly higher recurrence of bleeding as it was detected in seven patients out of 20 in comparison with one patient out 20 in the EBL group. **(17)** However, in another study re-bleeding after the onset of endoscopic treatment occurred in 4 (40%) patients in APC group, while in EBL group it occurred in 2 (20%) patients only with a significant difference between both groups. **(13)** Also, in a study on 36 cirrhotic patients with mainly diffuse type GAVE (34/36) recorded re-bleeding in eight out of eighteen patients in APC group and three out of eighteen patients in EBL group. **(12)**

As regarding **occurrence of complication**, both groups showed mild complications in the form of small superficial ulcers in APC group (three patients after 1st month , two patients after 2nd month and one patient after 3rd month follow up) and clean white base post band ulcers in EBL group (five patients after 1st month ,three patients after 2nd month and one patient after 3rd month follow up). These ulcers showed complete resolution during follow up on proton pump therapy only. Also, only one patient in both APC and EBL groups had a small size (less than 0.5 cm) sessile polyp with smooth surface and later follow up showed no change in its size. comparing these results between both groups was statistically non-significant. Results of the current study agree with the study done in 2016 **(16)** Also, in the research performed in2012, it was experienced that no operative complication except for post band superficial ulcer in one case in EBL group with no complications in APC group. **(3)** Unlike **Ablelwahab and his colleagues (2019),** who observed that no complications have occurred in the APC group, but in the EBL group 6 patients (33%) had complications which were not serious in form of hypertrophied polyps and post-band ulcerations, which were decreasing in the following sessions. **(12)**

By the end of follow up period only 1/25 case had **recurrence of GAVE** in EBL

group with no recurrence of GAVE in APC group. Also 2 cases in either groups required more sessions till GAVE eradication. However, after 6 months follow up; recurrence of GAVE in 8 patients (44%) in APC group and 3 patients (17%) in the EBL groups was noticed [(12)]. There was no statistically significant difference regarding the recurrence of GAVE between the two groups, but the recurrence of GAVE is less in the EBL group than the APC group. [(12)] Also results of the current study disagrees with others as during follow up of the 22 APC patients (mean, 16.6 months), endoscopies revealed the recurrence of GAVE in 15 patients requiring further treatment by APC (recurrence rate, 68.2%), but agrees greatly in a point that in the 12 EBL patients during follow up (mean, 14.6 months), endoscopies revealed the relapse of GAVE in one patient requiring further treatment by EBL (recurrence rate, 8.3%). [(3)] Moreover, it was noticed that during six months after complete ablation, only one case (5%) in EBL group had endoscopic recurrence of GAVE as compared to 8 cases (40%) in the APC group. [(18)]

Also, six patients of twenty treated by APC had relapse of GAVE after a median of 6.5 months (range 4–12) follow up. [(10)]

Conclusion

Both APC and EBL are effective treatment options for management of GAVE. EBL is effective in management of both diffuse and watermelon type GAVE as APC with non-significant superiority favors either modality. the number of endoscopic sessions till GAVE eradication varies from case to another according to extension of area affected by GAVE. Presence or absence of liver cirrhosis has no role in the rate or time till GAVE heals.

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