

Acute Embolic Stroke after Plug-Assisted Retrograde Transvenous Obliteration in Cirrhotic patient

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Introduction: Plug-Assisted Retrograde Transvenous Obliteration (PARTO) is a prophylactic procedure for gastric varices. It is a variant of Balloon-occluded retrograde transvenous obliteration (BRTO) that overcomes the drawbacks of BRTO such as long procedural time, complications associated with balloon indwelling and sclerosants. Here we report a case of a cirrhotic patient with gastric varices who developed acute embolic stroke after PARTO. **Case:** A 52-year-old woman with hepatitis C virus-related cirrhosis was admitted to our hospital for first prophylactic treatment of gastric varices. She underwent PARTO.(Fig.A) Thirty minutes after PARTO, the patient developed chest tightness, upper and lower extremity weakness, paresthesia and slight drowsiness. Her vital sign was stable. Chest x-ray, EKG and cardiac marker was normal. Her neurological examination revealed quadriplegia. Brain diffusion-weighted MR image showed multiple territory embolic stroke on both cerebellum, left occipital and bilateral frontoparietal lobe.(Fig.B,C,D) Crystalloid fluid, aspirin, atorvastatin were administered. Further evaluation for embolic stroke were performed. Transthoracic echocardiography and transesophageal echocardiography showed no embolism or structural abnormality. 24h holter monitoring was normal and pulmonary embolism computed tomography (CT) revealed no pulmonary thromboembolism or deep vein thrombosis. She underwent physical rehabilitation treatment and improved functional status to a normal level. Follow-up liver dynamic CT after 2 months showed vascular plug in left adrenal vein and gastroscopy after 1 year showed complete eradication of gastric varices. **Conclusion:** Known complication of PARTO includes potential worsening of esophageal varices and ascites. To our best knowledge, this is the first report of a case of an acute embolic stroke after PARTO. Cerebral embolic stroke is rare but possible complication of PARTO in certain susceptible individual. This complication should be suspected and treated in a patient with consistent clinical symptoms.

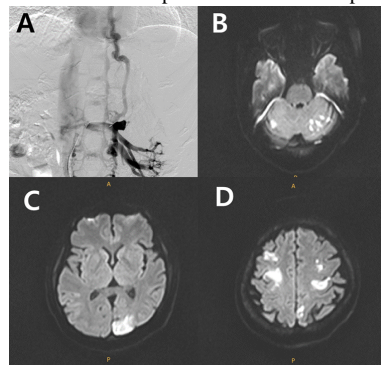


Figure 2. Receiver-operating characteristic curve of LSWE, SSWE, LSWE-SPS, SSWE-SPS, FIB-4, APRI and Child-Pugh Stage for the diagnosis of high risk esophageal varices. The best cut-off values for predicting high-risk esophageal varices were 14.3kPa: liver-SWE and 22.1kPa: spleen-SWE.

Figure 3. Plots show the distribution of (A) LSWE and (B) SSWE according to grade of esophageal varices. Increasing stiffness in spleen-SWE was proportionally correlated with grade of esophageal varices, whereas the stiffness in liver-SWE was not proportional.

Spleen stiffness estimation to detect high-risk esophageal varices in cirrhosis

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Background/Aims: Liver and spleen stiffness measured by 2dimensional shear-wave elastography have become Methods of interest with good reliability in detecting portal hypertension. Spleen stiffness reflects more accurately the dynamic changes occurring in advanced stages of cirrhosis compared to liver stiffness. We investigated the feasibility of liver and spleen-SWE for detection of esophageal varices and high-risk varices. **Methods:** A total of 191 cirrhotic patients who underwent liver stiffness (LSWE), spleen stiffness (SSWE) measurements using 2D-SWE (APLIO500,Toshiba), along with endoscopic screening were included. They were scored for parameters (liver stiffness spleen-diameter-to-platelet-ratio score [LSPS], spleen stiffness spleen-diameter-to-platelet-ratio score [SSPS]). High-risk esophageal varices defined as large esophageal varices (F2 or F3) or presence of red color sign. **Results:** Esophageal varices were present in 130 patients (68.1%). Regarding the presence of esophageal varices, diagnostic accuracy was better for stiffness in liver-SWE than in spleen-SWE (area under the receiver-operating characteristic curve[AUC], 0.830vs0.740; DeLong test, $p=0.050$). The best cut-off values in detecting esophageal varices were 14.1kPa for LSWE and 16.5kPa for SSWE. Unlike stiffness in LSWE, that in SSWE was positively correlated with the grade of esophageal varices. For the presence of high-risk esophageal varices, the AUC in SSWE was higher than LSWE (0.764vs0.742), albeit not significantly. The strongest association was found between high-risk esophageal varix and LSWE ($r=0.397, p<0.001$), while the second strongest association was found between Child-Turcotte-Pugh score ($r=0.353, p<0.001$) and LSWE ($r=0.314, p<0.001$). The best cut-off values for predicting high-risk esophageal varices were 14.3 kPa for LSWE and 22.1 kPa for SSWE. LSPS and SSPS, with AUC values between 0.837 and 0.799, also had good diagnostic accuracy in identifying esophageal varices. **Conclusions:** Stiffness measurements obtained by using 2D-SWE have effective noninvasive method for detection of esophageal varices. The stiffness in SSWE might be a better diagnostic value than LSWE for high-risk esophageal varices that require prophylactic therapy.

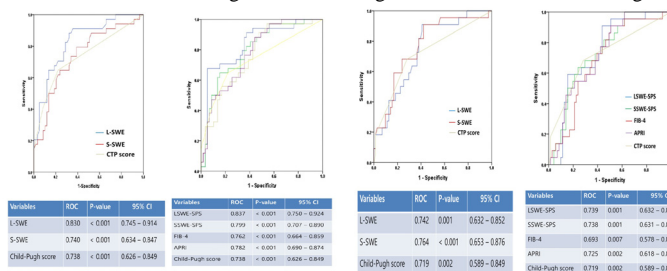


Table 1. Baseline characteristics of study population

	No EV (n=130)	EV (n=61)	p-value
Age (years)*	58.78 ± 12.1	59.39 ± 11.2	0.796
Sex			
Male, n (%)	98 (75.4)	46 (75.4)	0.997
Etiology, n (%)			0.026
Alcohol	74 (56.9)	47 (77.0)	
Viral	46 (35.4)	12 (19.7)	
Others	10 (7.7)	2 (3.3)	
Child Pugh Stage, n (%)			<0.001
A	122 (93.8)	36 (59.0)	
B	7 (5.4)	25 (41.0)	
C	1 (0.7)	0 (0.0)	
EV grade			
F1		25 (41.0)	
F2		76 (124.5)	
F3		7 (11.5)	
Hemoglobin	14.1 (12.8, 15.2)	12.5 (10.5, 14.0)	<0.001
AST	28.5 (21.8, 45.3)	48.0 (31.0, 64.5)	0.007
ALT	21.5 (13.0, 34.0)	23.0 (14.0, 33.0)	0.293
Albumin (g/dL)*	4.3 (3.9, 4.7)	3.5 (3.1, 4.2)	0.281
Total bilirubin (mg/dL)*	0.7 (0.6, 1.0)	0.8 (0.7, 1.0)	<0.001
PT (INR)*	1.1 (1.0, 1.1)	1.2 (1.1, 1.3)	<0.001
Creatinine (mg/dL)*	0.9 (0.8, 1.1)	0.8 (0.7, 1.0)	0.094
MELD score*			
Liver-SWE	10.6 (8.6, 13.9)	20.0 (14.1, 31.3)	<0.001
Spleen-SWE	18.6 (15.4, 22.3)	24.6 (19.3, 30.4)	<0.001
Spleen size	9.6 (8.2, 11.1)	11.5 (10.3, 13.6)	<0.001
LSWE_SPS	0.632 (0.375, 0.955)	2.650 (0.952, 4.876)	<0.001
SSWE_SPS	1.129 (0.824, 1.692)	2.972 (1.458, 5.154)	<0.001
FIB-4	2.226 (1.480, 3.949)	5.047 (3.195, 8.887)	<0.001
APRI	0.426 (0.299, 0.733)	1.073 (0.561, 2.075)	<0.001