the probability of including patients with obvious chronic pancreatitis as RAP is quite low.

In regard to their second and third points, the diagnosis of endocrine insufficiency was reported by the physician-investigator based on work up to the time of enrollment into the study, including repeated elevations in blood sugar, hemoglobin A1c or use of antidiabetic medications. As such, the diagnosis of endocrine insufficiency in our study being attributable solely to transient elevations in blood sugar levels during an episode of acute pancreatitis is unlikely. We agree with Dr. Hao, Li and Hu that it can be important to differentiate between Type 2 and 3c diabetes, but for the purposes of this quality of life study, we believe this differentiation is less important. Most important was the fact that having diabetes, regardless of type, negatively affected the patient's quality of life score.

CONFLICT OF INTEREST:

Guarantor of the article: Gregory A. Cote MD, MS.

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Potential competing interests: None.

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Balloon-Occluded Retrograde Transvenous Obliteration (BRTO) or Coil-Assisted Retrograde Transvenous Obliteration (CARTO): Which One Do We Choose?

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To the Editor: We read with great interest the recent article published in the *American Journal of Gastroenterology* by Edward W. Lee et al. [1]. This retrospective study identified that coil-assisted retrograde transvenous obliteration (CARTO) was an effective and safe treatment option for overt hepatic encephalopathy (HE) due to spontaneous portosystemic shunt (SPSS). We appreciate the novel innovation; however, several issues about the application of CARTO in the current study may need to be discussed here.

First, clinical success rate of CARTO in this article is not more effective than that of balloon-occluded retrograde transvenous obliteration (BRTO) described before [2] (91% (39/43) vs 100% (17/17)). This might be associated with the use of gelfoam slurry as the embolic material. Kim et al. [3] proposed that gelfoam could not offer the permanent endothelial destruction and thrombosis as seen with sclerosants.

Actually, the low toxic sclerosant used in our study [4], lauromacrogol, provided higher complete obliteration rate of 100% (31/31).

Second, based on the number of coils used during the procedure, CARTO is much more costlier than BRTO because coils are very expensive. The average number of coils used in this paper is 13.7 (range: 4–35), which could be a heavy economic burden for the patient. Relatively, a single intravascular balloon brings much more economic benefit.

Finally, the average procedure time is longer for CARTO than BRTO due to deployment of multiple coils versus placement of a single balloon for reduction of blood flow in the shunt. Indeed, the average procedure time is 2.1 h in the article and 2.82 h in another paper [5] by the same author using CARTO for treatment of gastric varices. However, the average procedure time in our BRTO study [4] was 1.6 h ($n = 31$, range: 40 min–3.0 h). Longer procedure time means more exposure of radiation for both the patient and operator, and more risk of procedure-related complications.

In summary, CARTO remains challenges including relatively low cost-effectiveness and long procedure time. Actually, CARTO is advantageous in situations like larger shunt size and severe vessel tortuosity not available for placement of the balloon [6]. BRTO with low toxic sclerosant like lauromacrogol, appears suitable as the first line choice for treatment of patients with refractory HE and SPSS. Compared studies regarding BRTO and CARTO with larger sample size are needed for further conclusion.

CONFLICT OF INTEREST

Guarantor of the article: Li Yang, MD.

Specific authors contribution: Yongjun Zhu was in charge of collecting paper information and clinical data. Yongjun Zhu and Xiaoze Wang contributed to the statistics and draft the manuscript. Xuefeng Luo and Li Yang were responsible for paper polishing and approved the final manuscript.

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Potential competing interests: None.

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Response to Yang et al.

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To the Editor: We appreciate the authors of this commentary showing an interest in our study. Our study was not intended to demonstrate the superiority of coil-assisted retrograde Transvenous obliteration (CARTO). We believe that all three (BRTO, CARTO, and PARTO) treatment options should be available at those insti-

tutions that treat the sequelae of portal hypertension.

Given the complexity of overt hepatic encephalopathy (OHE), we believe it will be challenging to achieve 100% clinical success to reverse their symptoms. Therefore, there is no perfect treatment option available for these patients yet. We believe a more significant number of patients is needed to understand and validate the true effects of CARTO or BRTO in OHE patients. Also, the success rate of CARTO (91%)[1] is in the similar range or better than other published studies (60–100%)[2–4]. It would be extremely difficult and challenging to state that one technique is better than others with a small number of patients and in a non-prospective manner.

Concerning gelfoam slurry vs. sclerosing agent, several studies have demonstrated the effectiveness of gelfoam slurry in the treatment of gastric varices and other portosystemic shunts with minimal complications and high clinical and technical efficacy [1, 2, 5–7]. Gelfoam may not cause permanent endothelial destruction; however, it does cause complete thrombosis with long-term follow-up shown in both CARTO and PARTO [1, 2, 5–7]. Lauromacrogol (polidocanol) has been shown to be effective [8–11]; however, there have been several reports of complications associated with its use [8–10].

If one analyzes the cost of supplies utilized in CARTO/PARTO vs. BRTO, CARTO/PARTO may be more expensive than BRTO as coils and plugs are more expensive than balloons in most institutions. However, if the overall cost of the procedure(s) is considered including (1) the cost of additional [2, 3] procedures in the angio suite required in BRTO to check the status of shunt/varices sclerosis (2), the cost of an ICU, or higher level of care room, required due to the pressure of an indwelling BRTO balloon (3), the cost of sclerosing agent (e.g., Sotradecol (STS) = \$450 US vs. gelfoam = \$16 US) and (4) the potential cost due to more severe complications caused by BRTO, we firmly believe the CARTO/PARTO can be cost-effective. However, no comparison study or prospective data are available to validate this.

Regarding the procedure time, again, a single procedure time of CARTO may be longer than BRTO or PARTO as it requires additional time to deploy multiple coils as stated in our study. However, if the overall procedure time is analyzed including the time of additional procedures as mentioned above, we believe that CARTO will be compared favorably to BRTO.

In summary, we firmly believe that the modified BRTO (CARTO/PARTO) has a vital role in managing patients with complications of portal hypertension, including gastric variceal bleeding and overt hepatic encephalopathy. Multiple studies have demonstrated its clinical efficacy and safety. CARTO has some distinct advantages in treating patients with large portosystemic shunts and very tortuous vascular anatomy. Many are reluctant to keep patients with balloons inflated in situ for prolonged periods of time. Also, potential rare complications from displaced sclerosants have presented BRTO from becoming a widely accepted procedure in the U.S. and Western countries. The relative safety of CARTO along with the operator comfort and familiarity associated with the use of coils and gelfoam provide an opportunity for many patients to benefit from this procedure in the future.

CONFLICT OF INTEREST

Guarantor of the article: Edward Wolfgang Lee, MD, PhD.

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