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Letter to the Editor

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Letter Regarding the Article by Ospel et al. Entitled "Endovascular Therapy for Cerebral Venous Thrombosis: Applying Lessons Learned from Clinical Trials of EVT in Acute Arterial Ischemic Stroke"

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Dear Editor,

We read the article "Endovascular Therapy for Cerebral Venous Thrombosis: Applying Lessons Learned from Clinical Trials of EVT in Acute Arterial Ischemic Stroke" [1]. This well-worthy review aimed to apply the lessons of study design and execution from clinical trials of endovascular treatment (EVT) in large vessel occlusion stroke on cerebral venous thrombosis (CVT). We wrote this letter to communicate with the author on this subject.

First, the penumbra concept is the theoretical foundation of reperfusion treatment [2, 3]. Based on the understanding of the penumbra, the clinician realized that if blood flow can be restored in time, the tissue in the penumbra may still be salvageable and prevented from developing into a permanent brain infarction [4, 5]. Subsequently, a series of the major clinical trials of EVT in large vessel occlusion stroke acquired heartening results which were attributed to the study design and execution of trials all based on the penumbra concept and the specific initiatives including (1) diverse severity scale and imaging techniques were developed to identify the characteristics of the salvageable tissue; (2) the multiple thrombectomy techniques and devices were utilized to restore the blood flow of the salvageable tissue fastly; (3) the modified Rankin Scale (mRS) was used to evaluate the disability improvement of patients after blood flow reperfusion of the salvageable tissue [6]. However, the core concept, similar to the penumbra concept of acute ischemic stroke, is absent in CVT. The lack of the core concept in CVT may be the underlying reason for failure in the clinical trial of EVT because we do not have adequate knowledge of the pathophysiology of the disease and do not know the intrinsic characteristics of the salvageable system of CVT, thus lead to the study design and execution trials fall into a dilemma. In our opinion, the scientific and rational core concept of CVT should be given the highest priority, as they are vital to guide the critical aspect of the study design, execution of the trials, and acquired positive outcomes.

Second, the article mentioned that determining the onset of the CVT and time-based windows for intervention is challenging. The article also indicated that determining the features of the patient population with the highest possible chance of technical EVT success is hard. We believe imaging cerebral veins/sinus thrombus may answer the above context. Specifically, (1) Hugues Chabriat and colleagues [7] reported that T2*SW and T1-weighted spin-echo image (T1SE) sequences have a high sensitivity to detect sinus or vein clots between day 1 and day 3. Additionally, our team previously found that the magnetic resonance black-blood thrombus imaging technique could detect

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thrombi with the onset of the disease within 7 days [8]. These imaging modalities and techniques provide us with a clue to identify the real onset time of the CVT. (2) Qi Yang and Xunming Ji and colleagues found an association between clot age and recanalization using magnetic resonance black-blood thrombus imaging technique in patients with severe CVT undergoing endovascular therapy. Their study showed that acute clot sign was associated with complete recanalization ($p < 0.001$), with an odds ratio of 3.937 (95% confidence interval, 1.6–9.5), and subacute clot sign was associated with partial recanalization ($p = 0.001$), with an odds ratio of 4.237 (95% confidence interval, 1.7–10.3) [9]. The rational reason behind this was that the acute clot is easier to completely recanalize because it primarily consists of red blood cells, and they become mechanically less compliant due to fibrin cross-linking and collagen deposition over time; subacute or chronic thrombi, which are rich in collagen and cross-linked fibrin, harden and are more difficult to disrupt [10–12].

Third, the article mentioned that over 85% of patients will eventually achieve an mRS of 0–2 (28), and many will remain functionally independent throughout their disease. However, the patients who have an mRS of 0–2 do not mean a favorable prognosis because 3/4 of survivors have residual symptoms, including persistent headache, recognition impairment, and psychological problems, which make these patients unable to come back to their normal life and work [13–16]. We look forward to receiving feedback and communicating with the author on this intriguing topic.

Statement of Ethics

Since no patient data were used for this paper, no ethics approval was required.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

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