



Treatment of a non-purulent intracranial venous sinus thrombus using a thrombectomy aspiration system: A case report[☆]



Qiuyan Lee, Xixiang Yu^{*}, Weiwei Yu

Wenzhou Medical University, University Town, Chashan, Wenzhou, Zhejiang, 325035, PR China

Introduction

Cerebral venous sinus thrombosis (CVST) is a special type of cerebrovascular disease characterized by obstruction of cerebral venous reflux, disturbance of cerebrospinal fluid absorption, and intracranial hypertension. It has many causes, and accounts for approximately 0.5%–1% of all strokes.¹ The morbidity of CVST is approximately 1.3/100,000,² with a mortality rate of approximately 5%–10%.³ It has various forms, different clinical manifestations, and lacks specificity; as such, it is easily missed and/or misdiagnosed, often resulting in delayed treatment. The current recommended treatment in patients not undergoing anticoagulation therapy is anticoagulation therapy as soon as possible.⁴ However, recent advances in intravascular mechanical thrombectomy techniques suggest that endovascular therapy can be used as an alternative.^{5–8} In this study, a patient with CVST was successfully treated with percutaneous intracranial venous thrombectomy using the AngioJet system (Boston Scientific, Marlborough, MA, USA). Clinical symptoms, including headache and vomiting, were significantly improved. Imaging confirmed removal of the thrombus and the patient was discharged 8 days after the procedure.

Case

A 31-year-old man was admitted to hospital due to “headache with nausea and vomiting for more than 6 hours”. The patient had no relevant medical history and was healthy in the past. On admission, no obvious abnormalities were found on physical examination. Preoperative magnetic resonance venography (MRV) revealed a dural sinus thrombosis (Fig. 1a). His D-dimer level was 12.49 mg/L, and low molecular weight heparin calcium (4100 IU) was initially administered subcutaneously every 12 h as anticoagulation therapy for 2 days. According to the 2019

edition of the Chinese Guidelines for Diagnosis and Treatment of Intracranial Venous Thrombosis, anticoagulation was recommended for 1–4 weeks⁴; however, the patient’s clinical symptoms did not improve significantly. Considering the presence of many thrombi and severe symptoms, anticoagulation alone could not achieve satisfactory results and the condition would likely persist. After discussion in the department, percutaneous intracranial venous thrombectomy was considered.

Ethical approval

The study was approved by the ethics committee of Wenzhou people’s Hospital. All clinical practices and observations were conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from each patient before the study was conducted.

Patient consent

Written informed consent was obtained from patients for publication of these case reports and any accompanying images.

Interventions

As mentioned above, after thorough evaluation and informed consent from the patient, interventional therapy was agreed upon. After successful puncture of the right internal jugular vein, a 6 F venous sheath was placed. Using a *Misgurnus anguillicaudatus* guidewire, a single curved catheter was sent to the right sagittal sinus, which revealed a large number of thromboses in the right intracranial vein that filled the entire venous sinus (Fig. 1b and c) then exited the catheter. An exchange guidewire was introduced into the thrombus removal catheter (Boke, AngioJet Solent Omni 120 cm × 6 F) (Fig. 1d) and connected to the

[☆] Fund projects: Zhejiang Medical and Health Science and Technology Plan Project (2019KY663), Wenzhou Science and Technology Plan Project of Zhejiang Province (Y20180182), Science and Technology Plan Project of Ruian City, Zhejiang Province (Y2014017).

^{*} Corresponding author.

E-mail addresses: 1370716697@qq.com (Q. Lee), yudsa@126.com (X. Yu).

<https://doi.org/10.1016/j.jimed.2021.02.005>

Received 19 November 2020; Received in revised form 18 February 2021; Accepted 21 February 2021

Available online 25 February 2021

2096-3602/© 2021 Shanghai Journal of Interventional Radiology Press. Publishing services by Elsevier B.V. on behalf of KeAi Communications Co. Ltd.

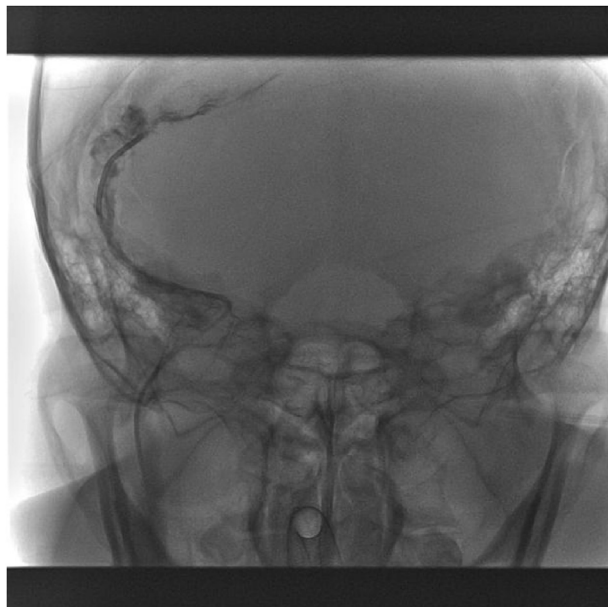
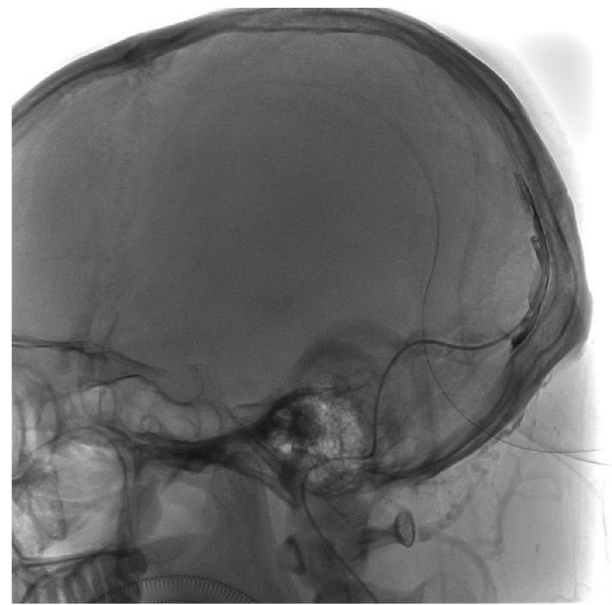
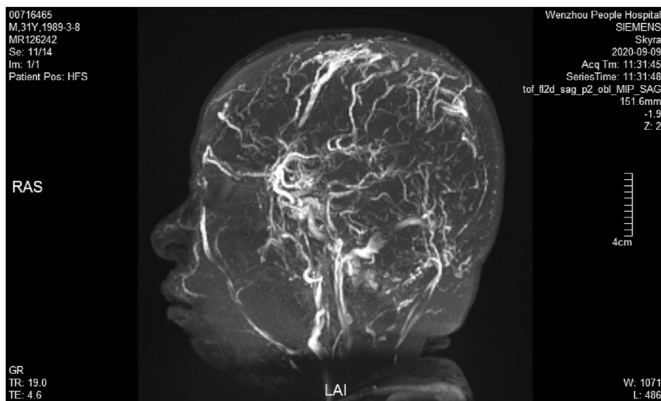


Fig. 1. a. MRV before the operation. b. Sagittal position of right sagittal sinus angiography before operation. c. Coronal angiography of right sagittal sinus before operation. d. AngioJet catheter was inserted into the right sagittal sinus.

thrombus removal device, with urokinase diluent (40 mL; urokinase 200,000 U + normal saline [100 mL]) injected through the catheter. The catheter was withdrawn while injecting, and was re-inserted into the sagittal sinus for thrombus aspiration as the catheter was withdrawn at the same time. After aspiration, angiographic re-examination confirmed clearance of the thrombus in the right intracranial venous sinus, unobstructed blood flow, and patency of the right intracranial venous sinus (Fig. 2a and b). During the operation, the patient's vital signs were stable, the procedure advanced smoothly, and the sheath was finally removed. Pressure bandaging was applied and, after the operation, the patient was transferred uneventfully to the intensive care unit. He was returned to the department on postoperative day 2 to undergo subcutaneous anti-coagulation therapy with low-molecular-weight heparin calcium (6150

IU) every 12 h. Four days later, the anticoagulation regimen included rivaroxaban (15 mg) *per os* twice daily. Six days after the operation, he underwent re-examination using MRV (Fig. 2c), which revealed that the left transverse sinus was not displayed, considering the residual thrombus. His D-dimer level was 1.69 mg/L. There were no obvious clinical symptoms on postoperative day 8; accordingly, he was discharged from hospital with continued oral rivaroxaban anticoagulation therapy.

Discussion

The main factor in improving the survival rate of patients with intracranial venous sinus is early active treatment to restore the patency

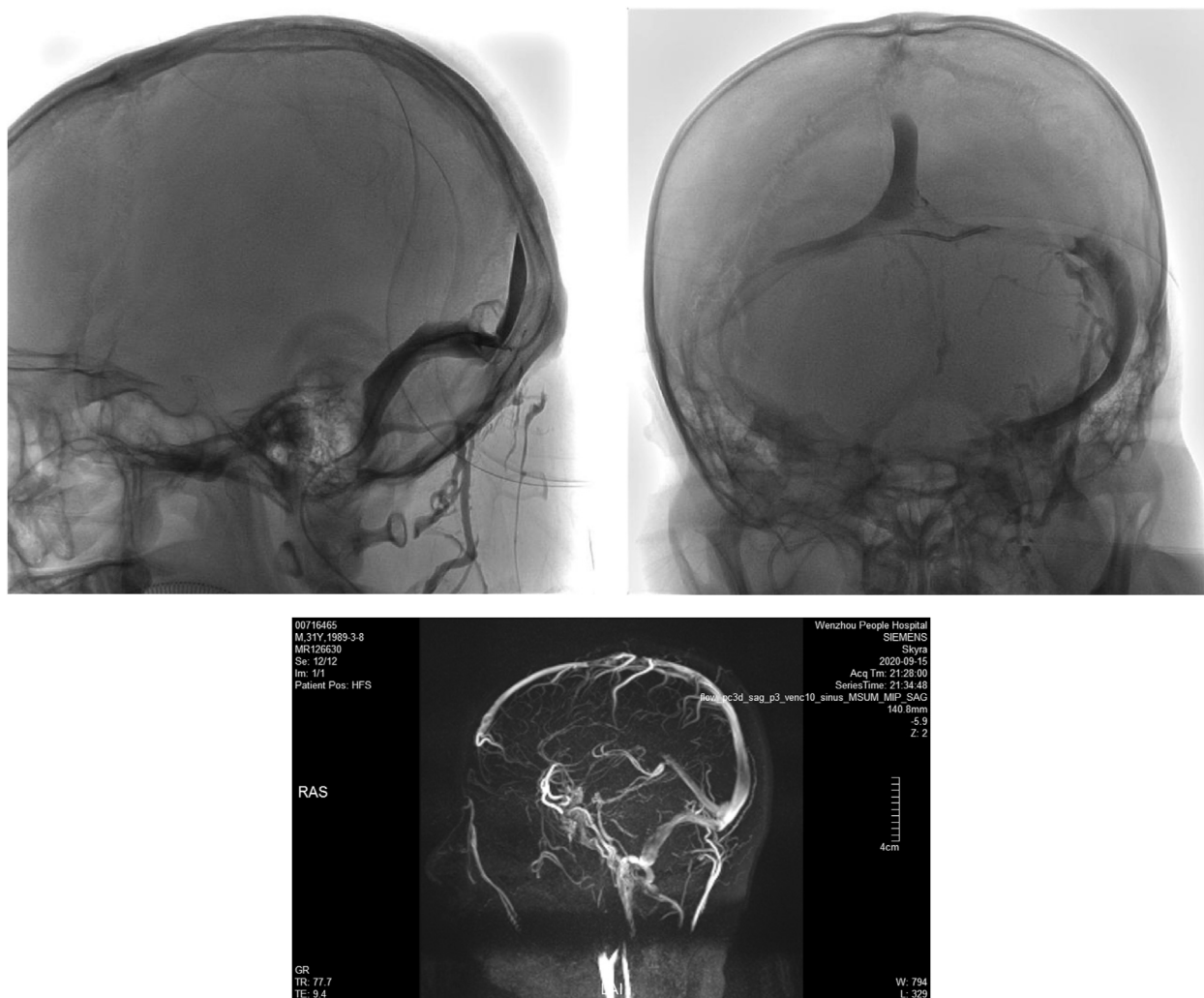


Fig. 2. a. Sagittal position of right sagittal sinus angiography after operation. b. Coronal angiography of right sagittal sinus after operation. c. MRV after the operation.

of the occluded vessel(s). The 2019 edition of the Chinese Guidelines for the Diagnosis and Treatment of Intracranial Venous Thrombosis proposes endovascular therapy for cerebral venous thrombosis as a new recommendation.⁴ A total of 17 studies comprising 235 patients treated with endovascular mechanical thrombectomy (EMT) were included in the analysis, which indicated that EMT was an effective salvage therapy for refractory CVST and demonstrated a reasonable safety profile. Chemical thrombolysis, in conjunction with EMT, did not appear to result in additional harm or benefit.⁹ The case described in the present report confirms the feasibility of local contact thrombolysis and mechanical thrombectomy for intracranial venous sinus thrombosis. EMT can be administered to severely ill patients in whom anticoagulation therapy is ineffective and there is no severe intracranial hemorrhage. Direct contact thrombolysis and intravascular thrombectomy can accelerate thrombolysis and improve the recanalization rate. However, there is little evidence to support the routine use of these intravascular techniques; as such, more research is needed to confirm their effectiveness and safety. Limitations to the present study include the absence of a lumbar puncture to measure intracranial pressure before and after the procedure, and the absence of an objective quantitative index for preoperative evaluation,

which should be examined future investigations.

Declaration of competing interest

The authors declare that they have no conflicts of interests to this work. We declare that we do not have any commercial or associative interest that represents a conflict of interest in connection with the work submitted.

References

1. Zeng Jinsheng, Yu Jian. Chinese guidelines for diagnosis and treatment of Intracranial Venous Thrombosis 2015. *Chin J Neurol.* 2015;48:819–829.
2. Coutinho JM, Zuurbier SM, Aramideh M, et al. The incidence of cerebral venous thrombosis: a cross-sectional study. *Stroke.* 2012;43:3375–3377.
3. Coutinho JM, Zuurbier SM, Stam J. Declining mortality in cerebral venous thrombosis: a systematic review. *Stroke.* 2014;45:1338–1341.
4. Chinese Society of Neurology. Chinese stroke society. Chinese guidelines for diagnosis and treatment of intracranial venous thrombosis 2019. *Chin J Neurol.* 2020;53:648–663.
5. Wang Hongguang, Fan Yimu. Advances in the treatment of intracranial venous sinus thrombosis. *Chin. J. Mod. Neurol.* 2020;20:472–475.

6. Zhou Hongyan, Zhang Deyuan, Sun Xunsha, et al. Literature analysis of the efficacy and safety of mechanical thrombectomy in the treatment of intracranial venous sinus thrombosis. *Chin J Evidence-Based Med.* 2019;19:836–843.
7. Bress A, Hurst R, Pukenas B, et al. Mechanical thrombectomy for cerebral venous sinus thrombosis employing a novel combination of Angiojet and Penumbra ACE aspiration catheters: the Triaxial Angiojet technique. *J Clin Neurosci.* 2016;31:196–198.
8. Ma J, Shui S, Han X, et al. Mechanical thrombectomy with Solitaire AB stents for the treatment of intracranial venous sinus thrombosis. *Acta Radiol.* 2016;57:1524–1530.
9. Ilyas A, Chen CJ, Raper DM, et al. Endovascular mechanical thrombectomy for cerebral venous sinus thrombosis: a systematic review. *J Neurointerventional Surg.* 2017;9:1086–1092.