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Ultra-Early Remote Intracranial Hemorrhage Complicating Intravenous Thrombolysis with Tenecteplase for Acute Ischemic Stroke

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Dear Editor,

A 63-year-old male with a history of nonanticoagulated atrial fibrillation and arterial hypertension presented with acute-onset right-sided hemiparesis and severe expressive aphasia [National Institutes of Health Stroke Scale (NIHSS) score of 11]. The rapid automated processing of perfusion software (IschemaView, Menlo Park, CA, USA) revealed a left-hemisphere penumbra with a volume of 101 mL, with a 0-mL predictable ischemic core (cerebral blood flow <30% at 0 mL), in the distribution of the left middle cerebral artery (MCA). CT angiography revealed complete occlusion of the left MCA by a 3.9-mm-long thrombus (Fig. 1A and B). The admission blood pressures and glucose level were 123/60 mm Hg and 94 mg/dL, respectively. By the time the patient received intravenous thrombolysis (IVT) with a tenecteplase bolus injection (dose of 0.25 mg/kg of body weight, onset-to-needle time of 120 minutes, and door-to-needle time of 30 minutes), there was a notable clinical improvement, to an NIHSS score of 5. The blood pressures remained below 150/80 mm Hg without the need for antihypertensive drugs.

Thirty minutes after administering the tenecteplase bolus and while preparing for mechanical thrombectomy (MT), the patient deteriorated again with right extremity weakness and severe aphasia (NIHSS score of 12). Urgent brain CT revealed small, remote, asymptomatic hemorrhagic foci in the right hemisphere (Fig. 1C). Nevertheless, the patient underwent MT with complete MCA reperfusion 72 minutes after injecting the tenecteplase bolus. The systolic and diastolic blood pressures during the intervention and before reperfusion were 130−180 mm Hg and 80−105 mm Hg, respectively. After reperfusion, the blood pressures were kept strictly below 140/80 mm Hg. At the end of the procedure, right internal carotid artery (ICA) catheterization showed contrast extravasation, with no underlying vascular pathology detected (Fig. 1D). The patient immediately received a 1-g bolus infusion of tranexamic acid, followed by the slow infusion of an additional 1 g over 1 hour. Follow-up brain CT confirmed the presence of a large right-hemisphere hematoma (Fig. 1E). The patient consequently underwent rescue hemicraniectomy with hematoma evacuation. At discharge, there were no detectable neurological deficits related to the initial left-MCA ischemic stroke. However, the patient had severe left-sided hemiparesis and hemianopia (NIHSS score of 12 and modified Rankin Scale score of 5).

Symptomatic intracerebral hemorrhage (sICH) is the most-feared complication of IVT, with an incidence ranging from 2% to 7%.[1] Remote parenchymal hematoma is associated with previous stroke (>3 months), older age, and female sex, and may be responsible for up to one-third of all post-IVT parenchymal hematomas.[2] Ultra-early postthrombolysis sICH (performed within 30 minutes of a bolus injection) is uncommon, and is seldom identified at its initiation.[3] sICH develops at a median time of 5−10 hours, whereas >80% of cases

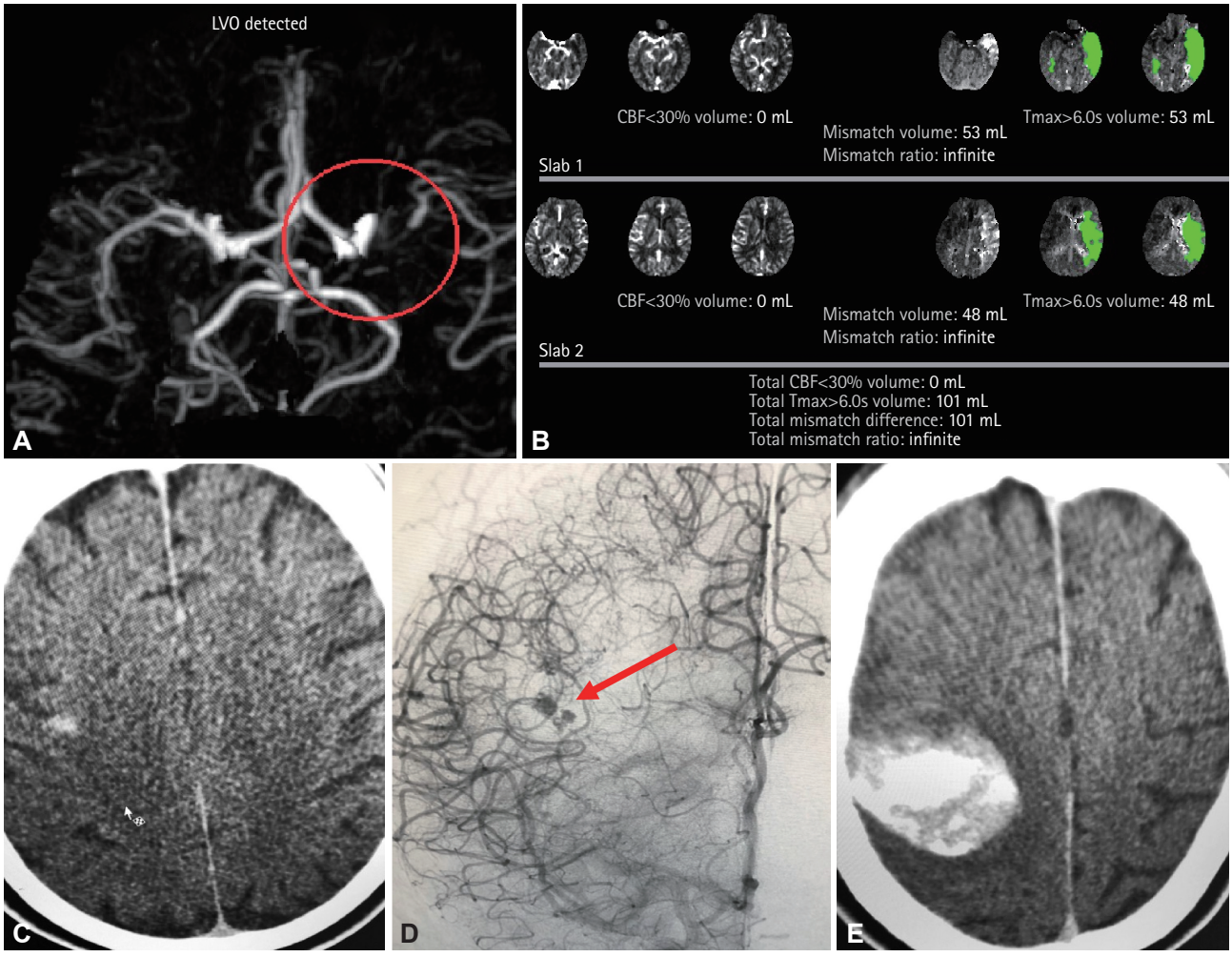

Fig. 1. Brain CT, rapid automated processing of perfusion, and digital subtraction angiography. A and B: Brain CT rapid automated processing of perfusion software revealing left-middle cerebral artery occlusion with a 101-mL penumbra and no ischemic core. C: Follow-up brain CT depicting a small remote asymptomatic hemorrhage in the contralateral hemisphere. D: Digital subtraction angiography showing contrast extravasation in the right hemisphere with no underlying vascular lesion. E: Brain CT confirming the presence of a large remote parenchymal hematoma.

develop >2 hours following the infusion of alteplase to treat acute ischemic stroke.[4-6] The rates of sICH after a tenecteplase infusion appear similar to those for alteplase, but there are no data in the literature on the timing of bleeding after administering a tenecteplase bolus.[7] The rapid correction of coagulopathy with administration of cryoprecipitate is currently the treatment of choice for thrombolysis-related sICH. If cryoprecipitate is not available, such as in the present case, antifibrinolytic agents such as tranexamic acid are potentially beneficial.[3]

The management of large-vessel occlusion (LVO) with concurrent remote, contralateral, postthrombolysis hemorrhage is challenging, and to our knowledge there are no case reports of remote hemorrhage before the successful reperfusion of an LVO. Capturing the remote hemorrhage at its initiation allowed us to continue with the MT with the aim of preventing the development of large bihemispheric lesions. In addition, performing catheterization contralateral to the occluded ICA allowed the intracranial bleeding to be depicted in real time as contrast extravasation, but also excluded the presence of an underlying vascular pathology. These observations highlight that remote intracranial bleeding may occur even in the absence of any detectable vascular or parenchymal lesion.

Author Contributions

Conceptualization: Georgios Tsivgoulis, Odysseas Kargiotis. Data curation: Odysseas Kargiotis, Maria Chondrogianni, Athina Andrikopoulou, Georgios Magoufis. Investigation: Odysseas Kargiotis, Apostolos Safouris, Klearchos Psychogios, Aikaterini Theodorou. Supervision: Georgios Tsivgoulis, Georgios Magoufis, Eleftherios Stamboulis. Writing—original draft: Odysseas Kargiotis, Georgios Tsivgoulis. Writing—review & editing: Georgios Tsivgoulis, Maria Chondrogianni, Athina Andrikopoulou, Apostolos Safouris, Klearchos Psychogios, Aikaterini Theodorou, Georgios Magoufis, Eleftherios Stamboulis.

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Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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