MRI Mismatch–Based Intravenous Thrombolysis for Isolated Cerebellar Infarction

Martin Köhrmann, MD; Roland Sauer, MD; Hagen B. Huttner, MD, PhD; Tobias Engelhorn, MD, PhD; Arnd Doerfler, MD, PhD; Peter D. Schellinger, MD, PhD

Background and Purpose—Cerebellar infarctions constitute a significant proportion of ischemic strokes and carry a substantial morbidity and mortality mainly because of swelling in the posterior fossa. No specific acute therapy is established, and patients are usually excluded from intravenous thrombolysis (IVT).

Methods—Two patients presented in an extended time window of 5 and 7 hours to our emergency department with sudden onset of severe cerebellar symptoms. After emergency MRI demonstrated superior cerebellar artery (SCA) occlusion with hypoperfusion of the respective territory and only minor DWI lesions, IVT was administered. Both patients recovered within a few hours after therapy and follow-up MRI on day 1 after treatment demonstrated only minor infarction.

Conclusion—We present to our knowledge the first cases of MRI mismatch–based IVT in an extended time window in patients with isolated SCA-infarctions. More studies are needed to evaluate IVT in this patient population. Modern imaging techniques might be helpful to select patients for therapy in posterior circulation strokes. (Stroke. 2009;40:1897-1899.)

Key Words: stroke ■ thrombolysis ■ MRI

Stroke in the posterior circulation accounts for up to 15% ischemic strokes and is associated with a high morbidity and mortality.1 Nevertheless, most treatment studies concentrate on the anterior circulation only. Although the approval-relevant NINDS trial allowed inclusion of posterior circulation strokes;2 they were excluded from most other randomized controlled trials (RCT) such as the ECASS trials. Thus, available data on the therapy of posterior circulation stroke is derived from smaller observational studies mainly concerning basilar artery occlusion (BAO), the most severe subtype of posterior circulation stroke.3 Despite the lack of RCTs there is accumulating evidence that intravenous thrombolysis (IVT) may be an alternative or even a comparable first-line treatment option for the treatment of BAO.3 However, almost no data are available for the treatment of isolated cerebellar infarction. We report our experience with stroke MRI–guided IVT in 2 patients with disabling cerebellar infarctions using the perfusion-diffusion–mismatch concept.

Patient 1
A 68-year-old woman presented 7 hours after sudden onset of severe vertigo, nausea, and vomiting. On admission she was drowsy, severely dysarthric, and unable to walk because of profound hemiataxia. Further neurological examination showed a vigorous downbeat nystagmus. Medical history consisted of long time hypertension, diabetes, adiposity, and a known but untreated arterial fibrillation. Emergent MRI demonstrated a perfusion deficit of the whole territory of the superior cerebellar artery (SCA) with no apparent diffusion deficit. MRA confirmed an occlusion of the proximal right SCA (Figure 1 and supplemental Figure I, available online at http://stroke.ahajournals.org). IVT was started after consent was obtained from the patient. Two hours after treatment, clinical symptoms resolved and a follow-up MRI performed 12 hours after treatment revealed recanalization of the SCA with reperfusion of the vascular territory and only a small DWI lesion (Figure 1 and supplemental Figure I). The patient was subsequently treated with oral anticoagulants and was discharged home with no neurological sequelae.

Patient 2
A 70-year-old man presented 5 hours after onset of vertigo, nausea, and vomiting, and a severe dysarthria with almost incomprehensible speech. Further symptoms consisted of a mild right-sided hemiparesis with severe ataxia leading to an inability to ambulate. The patient had a history of hypertension and hypercholesterolemia, and ECG in the emergency room revealed a previously unknown atrial fibrillation. Besides antihypertensive medication the patients had been on aspirin (100 mg/d) for general prophylaxis. Subsequent MRI showed only a small diffusion lesion, with a large perfusion deficit in the SCA territory corresponding to an occlusion of the SCA demonstrated by MRA (Figure 2 and supplemental Figure II, available online at http://stroke.ahajournals.org).
IVT was started after consent of the patient, and the patient was transferred to our stroke unit where symptoms were stable for 4 hours before rapidly regressing. Twelve hours after treatment the patient showed only minor vertigo which resolved over the following days. Follow-up MRI on day 1 revealed complete reperfusion of the SCA territory with no infarct growth compared to baseline MRI (Figure 2 and supplemental Figure II). The patient was started on anticoagulants and discharged home without persisting neurological symptoms.

Discussion

Cerebellar strokes constitute around 5% in clinicopathological and up to 10% in clinical series of cerebral infarctions with the most commonly affected regions being the territories of the superior cerebellar arteries (SCA)- and the posterior inferior cerebellar arteries (PICA).\textsuperscript{1,4} Previous studies have demonstrated a high morbidity and mortality in patients with cerebellar strokes mainly because of possible swelling in the posterior fossa.\textsuperscript{1,4} Although according to the NINDS criteria patients with cerebellar stroke would generally be eligible for IVT, these patients are usually not treated.\textsuperscript{2} Furthermore they were—and still are—generally excluded from RCTs. Thus the only recommended therapy given in international guidelines is decompressive surgery combined with extraventricular drainage in case of a space occupying infarction (class III, level C).\textsuperscript{1,5} It has to be noticed though that because of ethical concerns this approach was never tested in RCTs either.

Our presented cases are unique with regard to two aspects: First, to our knowledge there are no previous reports on IVT in isolated cerebellar infarctions. And second, the patients were treated in an extended time window of 5 and 7 hours, respectively, based on MRI criteria.

Little information is available on IVT for posterior circulation strokes, and data are almost exclusively derived from smaller observational studies on BAO in which IVT has
became an accepted treatment option. In a recent meta-analysis patients treated with intraarterial thrombolysis had better recanalization rates compared to IVT, but outcome was comparable. However, data for either approach are missing when it comes to isolated cerebellar strokes. Previous studies show that risk factors for anterior and posterior circulation strokes are comparable, suggesting that IVT might be equally beneficial for both territories, especially because in patients with occlusion of the SCA (as in our cases) a cardioembolic etiology is more frequently observed.

In recent years advanced imaging and especially multiparametric MRI techniques have been used to select patients for thrombolysis in extended time windows of up to 9 hours. Although no larger phase III studies are available to date, several phase II studies and large observational studies suggest that selection of patients by the perfusion-diffusion-mismatch paradigm indeed allows identifying patients with a higher chance to benefit from reperfusion therapies. In a prospective study of MRI changes in 10 patients receiving intraarterial thrombolysis for BAO, all patients with baseline perfusion and diffusion sequences demonstrated a mismatch. Overall the posttreatment DWI lesion was smaller than the initial perfusion lesion, demonstrating tissue salvage caused by recanalization. However, no data are available on PI/DWI mismatch for isolated cerebellar infarction.

In conclusion we report the first cases of IVT based on the PI/DWI-mismatch concept in patients with SCA-infarction. More studies are needed to evaluate whether IVT is a reasonable treatment option in this therapeutically neglected patient group and whether our findings in SCA-infarctions can be generalized to patients with infarctions affecting other vascular territories of the posterior circulation (eg, PICA-territory). In analogy to the anterior circulation advanced imaging techniques might be used to triage patients for treatment.

Disclosures
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References
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