Successful Reperfusion With Mechanical Thrombectomy Is Associated With Reduced Disability and Mortality in Patients With Pretreatment Diffusion-Weighted Imaging–Alberta Stroke Program Early Computed Tomography Score ≤6

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Background and Purpose—In acute ischemic stroke patients, diffusion-weighted imaging (DWI)–Alberta Stroke Program Early Computed Tomography Score (ASPECTS) is correlated with infarct volume and is an independent factor of functional outcome. Patients with pretreatment DWI-ASPECTS ≤6 were excluded or under-represented in the recent randomized mechanical thrombectomy trials. Our aim was to assess the impact of reperfusion in pretreatment DWI-ASPECTS ≤6 patients treated with mechanical thrombectomy.

Methods—We analyzed data collected between January 2012 and August 2015 in a bicentric prospective clinical registry of consecutive acute ischemic stroke patients treated with mechanical thrombectomy. Every patient with a documented internal carotid artery or middle cerebral artery occlusion with pretreatment DWI-ASPECTS ≤6 was eligible for this study. The primary end point was a favorable outcome defined by a modified Rankin Scale score ≤2 at 90 days.

Results—Two hundred and eighteen patients with a DWI-ASPECTS ≤6 were included. Among them, 145 (66%) patients had successful reperfusion at the end of mechanical thrombectomy. Reperfused patients had an increased rate of favorable outcome (38.7% versus 17.4%; P=0.002) and a decreased rate of mortality at 3 months (22.5% versus 39.1%; P=0.013) compared with nonreperfused patients. The symptomatic intracranial hemorrhage rate was not different between the 2 groups (13.0% versus 14.1%; P=0.83). However, in patients with DWI-ASPECTS <5, favorable outcome was low (13.0% versus 9.5%; P=0.68) with a high mortality rate (45.7% versus 57.1%; P=0.38) with or without successful reperfusion.

Conclusions—Successful reperfusion is associated with reduced mortality and disability in patients with a pretreatment DWI-ASPECTS ≤6. Further data from randomized studies are needed, particularly in patients with DWI-ASPECTS <5.

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Key Words: ischemic stroke ■ large ischemic lesion ■ outcome ■ reperfusion ■ thrombectomy

The extension of early ischemic signs on an acute head computed tomography (CT), assessed by the Alberta Stroke Program Early CT Score (ASPECTS), has been associated with a poorer outcome in patients treated with intravenous (IV) recombinant tPA (tissue-type plasminogen activator). Although originally designed for CT brain infarction volume evaluation, ASPECTS has been used for standardized scoring of magnetic resonance diffusion-weighted imaging.

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A list of all ETIS Research Investigators is given in the Appendix.

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imaging (DWI).\textsuperscript{2} DWI-ASPECTS was found to be superior in detecting brain infarction volume within the first hours compared with noncontrast CT alone.\textsuperscript{3} Recently, a DWI-ASPECTS \( \leq 6 \) threshold value was described as the best predictor for \( \geq 100 \) mL DWI lesion volume.\textsuperscript{3} Several studies reported that large initial DWI lesion volumes are an independent predictor of poor outcome in patients managed conservatively or with IV tPA.\textsuperscript{3-6} In the DEFUSE study (Diffusion and Perfusion Imaging Evaluation for Understanding Stroke Evolution), a lesion volume \( \geq 100 \) mL characterized a malignant course with high risk of symptomatic intracranial hemorrhage (SICH) and poor outcome after reperfusion.\textsuperscript{9} Similarly, another study found that a DWI-ASPECTS \( \leq 6 \) threshold predicts poor functional outcome and a high SICH risk after IV tPA therapy.\textsuperscript{10} Only a few mechanical thrombectomy (MT) studies analyzed the outcome after treatment of stroke with large DWI lesions.\textsuperscript{9,11} In fact, the reported low numbers of MT-treated patients with large DWI lesions are, at least in part, consecutive to a commonly accepted IV tPA contraindication. As a consequence, patients with pretreatment ASPECTS of 0 to 5 were under-represented among the 5 MT trials (\( n=57 \)).\textsuperscript{12} For example, in the EXTEND-IA trial (Extending the Time for Thrombolysis is Emergency Neurological Deficits-Intra-Arterial) and in SWIFT PRIME trial (Solitaire With the Intention for Thrombectomy as Primary Endovascular Treatment),\textsuperscript{13,14} patients were excluded if ischemic core volumes were \( >70 \) mL and \( >50 \) mL, respectively. The ESCAPE trial (Endovascular Treatment for Small Core and Proximal Occlusion Ischemic Stroke) excluded patients with ASPECTS \( <6 \), and the REVASCAT trial (Randomized Trial of Revascularization With Solitaire FR Device Versus Best Medical Therapy in the Treatment of Acute Stroke due to Anterior Circulation Large Vessel Occlusion Presenting Within 8 Hours of Symptom Onset) excluded those with ASPECTS \( <7 \) or DWI-ASPECTS \( <6 \).\textsuperscript{15,16}

The aim of this study was to assess the impact of reperfusion in patients with pretreatment DWI-ASPECTS \( \leq 6 \) treated with MT in a large bicentric prospective registry.

**Methods**

**The ETIS Registry**

Patients were identified from a bicentric prospective clinical registry of acute ischemic stroke patients treated with MT between January 2012 and August 2015 (ETIS registry [Endovascular Treatment in Ischemic Stroke]). Detailed material and methods have been previously reported.\textsuperscript{11} The local ethics committee approved this research protocol.

**Sample Selection**

Patients with a complete occlusion of the internal carotid artery or the middle cerebral artery (M1 and M2 segments) treated by MT and evaluated by pretreatment DWI as score \( \leq 6 \) were enrolled in this study (Figure 1).

**Data Collection**

Patient demographics, vascular risk factors, imaging findings, vital signs before treatment, severity of ischemic stroke, and clinical outcomes were prospectively collected using a structured questionnaire. The severity of the ischemic stroke was assessed using the National Institutes of Health Stroke Scale (NIHSS) score at admission and 24 hours after the initiation of treatment. Time from symptom onset to initiation of IV tPA, to groin puncture, and to reperfusion was recorded. A neuroradiologist calculated the DWI-ASPECT score on the pretreatment magnetic resonance imaging blinded to the results of the endovascular procedure. Each ASPECTS region was scored 0 if abnormal and 1 if normal. To be considered as abnormal, DWI hyperintense signal did to be confluent. A small hyperintense speck was not enough. Arterial occlusion site and status were monitored with conventional angiography during the endovascular therapy. Reperfusion results were reported using the Thrombolysis in Cerebral Ischemia (TICI) score and were defined as ranging from no reperfusion (TICI score 0) to complete reperfusion (TICI score 3), including partial reperfusion (TICI score 2). TICI score 2 was further divided into 2a and 2b as \(<50\%\) and \(>50\%\) reperfusion of the middle cerebral artery territory, respectively. For each patient, the final TICI score was retrospectively assessed by a neurointerventionalist blinded to the clinical outcome. Successful reperfusion was defined as a final TICI score \( \geq 2b \). All patients had a CT or magnetic resonance imaging 24 hours after treatment onset to assess hemorrhagic complications. Trained research nurses unaware of the study group assignments assessed the modified Rankin Scale at 90 days, during face-to-face interviews or via telephone conversations with the patient, their relatives, or their general practitioner.

**Figure 1.** Flow chart of the study. ASPECTS indicates Alberta Stroke Program Early CT score; DWI, diffusion-weighted imaging; CT, computed tomography; and MRI, magnetic resonance imaging.
Clinical Outcome Definitions

Intracranial hemorrhage (ICH) was classified according to the ECASS criteria (European Cooperative Acute Stroke Study) (hemorrhagic infarction 1 and 2; parenchymal hematoma [PH] 1 and 2). SICH was defined as an increase of 4 or more points of NIHSS within 24 hours attributable to ICH, early neurological improvement as NIHSS score 0 to 1 at 24 hours, or a decrease of 4 or more points in NIHSS score at 24 hours.

The primary study outcome was the percentage of patients who achieved a good outcome, defined as a mRS score of 0 to 2 at 3 months. Secondary outcomes included the overall distribution of 90-day mRS (shift analysis), early neurological improvement, any ICH, SICH, and mortality at 90 days.

Endovascular Procedure

All patients were treated in a dedicated neuroangiography suite under conscious sedation or general anesthesia after evaluation by a dedicated anesthesiology team. The thrombectomy procedure was chosen at the interventionalist’s discretion, using a stent retriever or a direct aspiration first path technique in the first instance. Periprocedural complications (embolization in a new territory, defined as an angiographic occlusion in a previously unaffected vascular territory observed on the angiogram after clot removal, arterial dissection or perforation, vasospasm, subarachnoid hemorrhage) were reported. The detailed technical procedure has been published previously.17

Statistical Analysis

Quantitative variables are expressed as means±standard deviation or medians (interquartile range), and categorical variables are expressed as numbers (percentage). Normality of distributions was assessed using histograms and the Shapiro–Wilk test. Bivariate comparisons between patients with and without successful reperfusion were made using the Chi-square test or Fisher exact test for categorical variables, the Cochran–Armitage trend test for ordinal variables, and Student’s t test or Mann–Whitney U test for quantitative variables as appropriate. Differences in binary outcomes (favorable outcome, early neurological improvement, 90-day mortality, and ICH) between the 2 groups were expressed as relative risks with 95% confidence intervals (CIs), and difference in ordinal outcome (overall distribution in 90-day mRS) was expressed as common odds ratio for 1-point improvement calculated using ordinal logistic regression model (shift analysis). We assessed the heterogeneity in relationship between successful reperfusion and each outcome across the 2 centers using the Breslow–Day test or by testing for interaction term into ordinal logistic regression model. Comparisons between outcomes were further adjusted for prespecified confounding factors (age, center, and admission NIHSS) and baseline differences (at P<0.10 in bivariate analyses) using a Poisson regression model with robust error variance15,16 for binary outcomes and ordinal logistic regression model for overall distribution of mRS. Because of missing data in outcomes (favorable outcome and mortality, 5.5%; early neurological improvement, 11.5%; ICH complications, 4.1%); we performed sensitivity analyses using multiple imputation approach to handle missing values. Missing data were imputed under missing at random assumption by using regression switching approach (chained equation with m=10 imputations obtained using the R statistical software version 3.0.3). Imputation procedures were performed using all variables listed in Table 1 and each study outcomes. Regression estimates obtained in the different imputed data sets were combined using the Rubin’s rules. Further comparisons in outcomes between patients with and without successful reperfusion were made in 3 DWI-ASPECTS subgroups (0–4 versus 5 versus 6). We did not attempt to test heterogeneity in the DWI-ASPECTS subgroups because of the small sample size in some strata. Finally, among patients with successful reperfusion, we assessed the impact of TICI grade flow and time from symptom onset to reperfusion (after categorization into quartiles) in bivariate analyses using the Chi square test or the Cochran–Armitage trend test. Statistical testing was done at the 2-tailed α level of 0.05. Data were analyzed using the SAS software version 9.3 (SAS Institute, Cary, NC).

Results

During the study period, a total of 854 acute ischemic stroke patients with internal carotid artery or middle cerebral artery occlusion were consecutively treated by MT in the 2 participating centers. Of these, 637 patients were excluded from the...
present study analysis for the following reasons: no available measure of DWI-ASPECTS (n=121), DWI-ASPECTS ≥6 (n=498), lost to follow-up (n=17), and <18 years old (n=1; Figure 1). Of the 218 included patients with DWI-ASPECTS ≤6, 66.5% achieved a successful reperfusion (n=86 with TICI score 2b, n=59 with TICI score 3) after a median time from symptom onset of 310 minutes (interquartile range, 250–370).

As shown in Table 1, there was no significant difference in baseline characteristics between patients with and without successful reperfusion. We found only a trend to achieve reperfusion more often in men, in patients who received IV thrombolysis prior to MT, and in patients treated without general anesthesia.

As shown in Figure 2, patients with successful reperfusion had a lower mRS score at 90 days after MT than the patients without successful reperfusion (common odds ratio for 1-point improvement in mRS, 2.38; 95% CI, 1.40–4.02; P=0.001). Favorable outcome was achieved more often in patients with successful reperfusion than in those without (38.7% versus 17.4%; P=0.002). A similar difference was found when considering early neurological improvement outcome (Figure 3).

Conversely, patients with successful reperfusion had a lower mortality rate (22.6% versus 39.1%; P=0.013) than the patients without successful reperfusion. Regarding hemorrhagic complications, there were no significant between-group differences, with an overall rate of any ICH, PH, and SICH of 56.9%, 19.6%, and 13.4% respectively. No significant heterogeneity in impact of successful reperfusion on outcomes across the 2 centers was found (data not shown).

After adjustment for age, sex, center, admission NIHSS, previous use of IV thrombolysis, and use of general anesthesia, the between-group difference in successful reperfusion remained associated with an increased rate of favorable outcome and early improvement in the 2 upper DWI-ASPECTS subgroups; a similar finding was found in shift analysis (Figure 1 in the online-only Data Supplement). Of note, the impact of successful reperfusion on favorable outcome did not reach the significance level in patients with DWI-ASPECTS of 5 (Table 2). Mortality remained also decreased in reperfused compared with nonreperfused patients in the 2 upper DWI-ASPECTS subgroups, with a difference which reached significance in patients with DWI-ASPECTS of 5 (40.9% versus 11.8%; P=0.012). In patients with a DWI-ASPECTS of 0 to 4, the favorable outcome was low in those both with and without successful reperfusion (13.0% versus 9.5%; P=0.68) with a high mortality rate (45.7% versus 57.1%; P=0.38). Successful reperfusion was not associated with ICH whatever the DWI-ASPECTS subgroup. Of note, in the DWI-ASPECTS 0 to 4 subgroup patients, there was a
Impact of Successful Reperfusion in Large Ischemic Lesions

Table 2. Impact of Successful Reperfusion on Outcomes According to DWI-ASPECTS Subgroups

<table>
<thead>
<tr>
<th>Outcome/DWI-ASPECTS</th>
<th>Successful Reperfusion Status</th>
<th>No (n=73)</th>
<th>Yes (n=145)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–4</td>
<td></td>
<td>9.5 (2/21)</td>
<td>13.0 (6/46)</td>
<td>1.00*</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>27.3 (6/22)</td>
<td>50.0 (17/34)</td>
<td>0.091</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>15.4 (4/26)</td>
<td>52.6 (30/57)</td>
<td>0.001</td>
</tr>
<tr>
<td>Early neurological improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–4</td>
<td></td>
<td>9.5 (2/21)</td>
<td>23.1 (9/39)</td>
<td>0.30*</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>11.1 (2/18)</td>
<td>52.9 (18/34)</td>
<td>0.003</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>29.6 (8/27)</td>
<td>57.4 (31/54)</td>
<td>0.018</td>
</tr>
<tr>
<td>90-day mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–4</td>
<td></td>
<td>57.1 (12/21)</td>
<td>45.7 (21/46)</td>
<td>0.38</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>40.9 (9/22)</td>
<td>11.8 (4/34)</td>
<td>0.012</td>
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<tr>
<td>6</td>
<td></td>
<td>23.1 (5/22)</td>
<td>10.5 (6/57)</td>
<td>0.18*</td>
</tr>
<tr>
<td>Any ICH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–4</td>
<td></td>
<td>72.7 (17/22)</td>
<td>60.9 (28/46)</td>
<td>0.34</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>63.6 (14/22)</td>
<td>48.6 (17/35)</td>
<td>0.27</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>51.9 (14/27)</td>
<td>52.6 (30/57)</td>
<td>0.95</td>
</tr>
<tr>
<td>PH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–4</td>
<td></td>
<td>45.5 (10/22)</td>
<td>23.9 (11/46)</td>
<td>0.072</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>13.5 (3/22)</td>
<td>17.1 (6/35)</td>
<td>1.00*</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>18.5 (5/27)</td>
<td>10.5 (6/57)</td>
<td>0.32*</td>
</tr>
</tbody>
</table>

Values are percentage (no/total no) unless otherwise indicated. P values were calculated using the Chi square test or Fisher exact test. Favorable outcome was defined as a 90-day mRS score ≤2. Early neurological improvement was defined as NIHSS score 0–1 at 24 h or a decrease of 4 or more points in NIHSS score at 24 h. ASPECTS indicates Alberta Stroke Program Early CT score; DWI, diffusion-weighted imaging; ICH, intracranial hemorrhage; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; and PH, parenchymal hemorrhage.

*Fisher exact test.

nonsignificant trend of a decreased PH rate in case of successful reperfusion (45.5% versus 23.9%; P=0.072).

Discussion

In this population of MT-treated acute ischemic stroke patients with pretreatment DWI-ASPECTS ≤6, successful reperfusion was strongly related to clinical outcome. Compared with nonreperfused patients, those with successful reperfusion experienced an increased rate of favorable outcome, early neurological improvement, and a decreased risk of 3-month mortality. Furthermore, the occurrence of a successful reperfusion did not impact the ICH risk. However, comparisons performed in 3 DWI-ASPECTS subgroups (0–4 versus 5 versus 6) showed that in patients with DWI-ASPECTS of 0 to 4, successful reperfusion was not associated with a favorable outcome but did not increase in ICH or 3-month mortality.

For the first time, we show that successful reperfusion is associated with a reduced 3-month mortality rate in MT-treated patients with DWI-ASPECTS ≤6. These findings suggest that successful reperfusion may prevent DWI lesion growth, avoiding malignant infarction evolution responsible for mortality.

This is the largest series focusing on MT-treated patients with large infarct volumes. Our findings are in accordance with 2 recent retrospective studies that found a clinical benefit of successful reperfusion in MT- or IV tPA alone-treated patients with pretreatment DWI volume >70 mL. Among MT-treated patients with DWI volume >70 mL, favorable outcome was achieved after successful reperfusion in 33% of patients, whereas after poor or failed reperfusion, outcome was favorable in only 8% of patients. The latter studies showed no effect on mortality, as reported in 4 out of 5 randomized studies on thrombectomy published in 2015. The mortality reduction observed in our study may be explained by the fact that the target population (ie, with the largest acute ischemic stroke volumes) has certainly the highest mortality rate with conventional treatment. In fact, this population is probably the best to study an impact on mortality. The observed effect on mortality is critical and contrasts with previous studies, suggesting that reperfusion in large strokes has a detrimental effect with an increased risk of ICH and mortality. The DEFUSE study (Diffusion and Perfusion Imaging Evaluation for Understanding Stroke Evolution) identified a malignant profile defined by a pretreatment DWI lesion volume >100 mL based on a cohort of 6 patients who experienced poor outcome after reperfusion. This threshold was not confirmed by a pooled DEFUSE/EPITHET (Echoplanar Imaging Thrombolysis Evaluation Trial) database analysis that demonstrated that only a perfusion-weighted imaging threshold (Tmax>8 s) with 100 mL DWI volume was relevant to identify patients with a malignant profile. The small sample size (n=9 versus 18) of the latter study is certainly a significant shortcoming, in addition with differences in baseline characteristics between reperfused and not reperfused patients (median age, 82 versus 64 years; percent of IV tPA, 78% versus 33%, respectively). These studies defined reperfusion on perfusion-weighted magnetic resonance imaging criteria as a reduction in volume of Tmax>6 s on the follow-up scan whatever the arterial status (>30% reduction in Tmax>6 s at 3–6 hours in DEFUSE study and >90% reduction in Tmax>6 s at 3–5 days in EPITHET study). More recently, a study on a large retrospective series of patients with baseline CT perfusion scan and successful MT reperfusion (TICI score 3) suggested that large Tmax>10 s lesions do not seem to be associated with a higher ICH risk and do not preclude good outcomes in MT-eligible patients.

The beneficial effect of successful MT reperfusion was only observed among patients with DWI-ASPECTS of 5 and 6 but not among those with larger stroke volumes (DWI-ASPECTS 0–4). Still, there was a trend toward better early neurological outcome (23.1% versus 9.5%), lower mortality rate at 3 months (45.7% versus 57.1%), and lower PH rate (23.9% versus 45.5%) in the reperfused DWI-ASPECTS 0 to 4 subgroup patients compared with nonreperfused patients. Further data from randomized studies are needed to clarify the potential benefit of MT in this subgroup of patients. Our study was certainly not powered to analyze the effect of age and onset-to-reperfusion time among reperfused versus nonreperfused patients with DWI-ASPECTS of 0 to 4.
Our study has some limitations. First, because of the use of DWI-ASPECTS for brain volume infarct evaluation rather than DWI volumetric measurements. Indeed, despite a significant negative correlation between DWI-ASPECTS and DWI volume, DWI-ASPECTS includes a wide variation of lesion volumes for each score value and rather poorly correlates with stroke lesion volume, especially in the deep middle cerebral artery territory.4 However, this is a pragmatic approach frequently used in clinical setting. In fact, DWI-ASPECTS is straightforward, reproducible, and feasible in centers not equipped with automated software. Additionally, limitations inherent to the retrospective analysis need to be considered.

In our study, we show that in the setting of low pretreatment DWI-ASPECTS, MT-induced reperfusion did not affect the ICH rate. ICH seems to be associated with the initial ischemic stroke severity rather than with the early reperfusion status. These data are in accordance with a previous large endovascular study that found no significant association between blood–brain barrier disruption and successful MT reperfusion.22 This point is still source of debate because another study from a pooled DEFUSE/EPITHET database analysis found that very low cerebral blood volume predicted SICH and PH after thrombolysis, and this predictive value was more relevant in case of reperfusion.24

Our findings suggest that large DWI lesion volumes should not preclude patients from reperfusion therapies, including IV tPA and MT. Further randomized data are needed to confirm this conclusion.

Appendix

ETIS (Endovascular Treatment in Ischemic Stroke)—Research Investigators

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Disclosures

Drs Blanc and Piotin received Institutional grants from Stryker, Medtronic, Microvention, and Balt. Dr Lapergue received funding for travel by Medtronic and speaker honoraria from Penumbra. Drs Piotin and Blanc are proctors for Medtronic Pipeline Case. Dr Mazighi received funding for travel and speaker honoraria from Covidien, Boehringer Ingelheim, and Bayer and honoraria from Servier for teaching engagements as a consultant. The other authors report no conflicts.

References


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/content/48/5/e138.full.pdf

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Correction to: Successful Reperfusion With Mechanical Thrombectomy Is Associated With Reduced Disability and Mortality in Patients With Pretreatment Diffusion-Weighted Imaging–Alberta Stroke Program Early Computed Tomography Score ≤6

In the article by Desilles et al, “Successful Reperfusion With Mechanical Thrombectomy Is Associated With Reduced Disability and Mortality in Patients With Pretreatment Diffusion-Weighted Imaging–Alberta Stroke Program Early Computed Tomography Score ≤6,” which published online ahead of print February 24, 2017, and appeared in the April 2017 issue of the journal (Stroke. 2017;48:963–969. DOI: 10.1161/STROKEAHA.116.015202), a correction is needed.

On page 968, in the Appendix, “Frederic Bourdin, f.bourdin@hopital-foch.org,” has been changed to read “Frederic Bourdain, frederic.bourdain@hopital-foch.org”; and “Mickael Obadia,” has been changed to read “Michael Obadia.”

This correction has been made to the current online version of the article, which is available at http://stroke.ahajournals.org/content/48/4/e120.
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On page 963, in the author byline, “Arthuro Consoli, MD,” has been changed to read “Arturo Consoli, MD.”

This correction has been made to the current online version of the article, which is available at http://stroke.ahajournals.org/content/48/4/963.
Supplemental Figure I. Distribution of modified Rankin Score (mRs) at 90 days according to successful reperfusion status and DWI-ASPECTS. Common odds ratio (OR) for 1-point improvement in mRs calculated using ordinal logistic regression model are reported.

Supplemental Table I. Outcomes in patients with Successful recanalization according to TICI grade

<table>
<thead>
<tr>
<th>TICI grade</th>
<th>2b (n=86)</th>
<th>3 (n=59)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable outcome</td>
<td>34 (41.5)</td>
<td>19 (34.6)</td>
<td>0.42</td>
</tr>
<tr>
<td>Early neurological improvement</td>
<td>30 (40.0)</td>
<td>28 (53.9)</td>
<td>0.13</td>
</tr>
<tr>
<td>90-day mortality</td>
<td>17 (20.7)</td>
<td>14 (25.5)</td>
<td>0.52</td>
</tr>
<tr>
<td>Any ICH</td>
<td>48 (59.3)</td>
<td>27 (47.4)</td>
<td>0.17</td>
</tr>
<tr>
<td>PH</td>
<td>13 (16.1)</td>
<td>10 (17.5)</td>
<td>0.82</td>
</tr>
<tr>
<td>Symptomatic ICH</td>
<td>10 (12.4)</td>
<td>8 (14.0)</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Values are n(%) unless otherwise indicated. P-Values were calculated using the Chi-Square test. Favorable outcome was defined as a 90-day mRS ≤ 2 and early neurological improvement as NIHSS score 0–1 at 24 h or a decrease of 4 or more points in NIHSS score at 24 h. Abbreviations: ICH=intracranial haemorrhage, IV=intravenous; NIHSS=National Institutes of Health Stroke Scale, mRs=modified rankin score, PH=Parenchymal Hemorrhage.
Supplemental Table II. Outcomes in patients with Successful recanalization according to recanalization time from symptom onset

<table>
<thead>
<tr>
<th>Quartiles of recanalization time, minutes</th>
<th>&lt;250</th>
<th>250-309</th>
<th>310-369</th>
<th>≥370</th>
<th>( P ) *\text{†}</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=34)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Favorable outcome</td>
<td>16 (50.0)</td>
<td>12 (33.3)</td>
<td>11 (32.4)</td>
<td>13 (43.3)</td>
<td>0.40/0.58</td>
</tr>
<tr>
<td>Early neurological improvement</td>
<td>18 (58.1)</td>
<td>14 (45.2)</td>
<td>14 (43.8)</td>
<td>11 (37.9)</td>
<td>0.45/0.13</td>
</tr>
<tr>
<td>90-day mortality</td>
<td>5 (15.6)</td>
<td>11 (30.6)</td>
<td>6 (17.7)</td>
<td>7 (23.3)</td>
<td>0.44/0.79</td>
</tr>
<tr>
<td>Any ICH</td>
<td>17 (53.1)</td>
<td>21 (58.3)</td>
<td>20 (60.6)</td>
<td>16 (48.5)</td>
<td>0.76/0.75</td>
</tr>
<tr>
<td>PH</td>
<td>3 (9.4)</td>
<td>7 (19.4)</td>
<td>6 (18.2)</td>
<td>7 (21.2)</td>
<td>0.59/0.26</td>
</tr>
<tr>
<td>Symptomatic ICH</td>
<td>2 (6.3)</td>
<td>5 (13.9)</td>
<td>4 (12.1)</td>
<td>7 (21.2)</td>
<td>0.37/0.11</td>
</tr>
</tbody>
</table>

Values are n(%) unless otherwise indicated.

* \( P \)-Values for comparison between quartiles (Chi-Square test or Fisher's exact test).
† \( P \)-Values for linear trend across quartiles (Cochran-Armitage trend test).

Favorable outcome was defined as a 90-day mRS ≤ 2 and early neurological improvement as NIHSS score 0–1 at 24 h or a decrease of 4 or more points in NIHSS score at 24 h.

Abbreviations: ICH=intracranial haemorrhage, IV=intravenous; NIHSS=National Institutes of Health Stroke Scale, mRS=modified rankin score, PH=Parenchymal Hemorrhage.