Intra-arterial treatment by means of retrievable stents has been proven safe and effective. In MR CLEAN (Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands), the choice of the type of thrombectomy device was left to the discretion of the interventionist. The aim of this study was to explore the differences in functional outcome, neurological recovery, reperfusion, extent of infarction, and adverse events according to stent type and make.

Methods—The primary outcome was functional outcome at 90 days, assessed with the modified Rankin Scale (mRS). Neuroimaging outcomes included occlusion on computed tomographic angiography at 24 hours, infarct volume at 5 to 7 days, and modified thrombolysis in cerebral infarction scores. Safety outcomes included death within 90 days and any symptomatic intracerebral hemorrhage. We analyzed possible interactions between stent type and treatment with multiple regression models. Treatment effects were adjusted for patient age, stroke severity, and collateral score.

Results—Of the 500 patients included in the trial, 233 were allocated to intervention. Of these, 124 (53%) were first treated with Trevo (adjusted common odds ratio for shift on the mRS [acOR, 1.98; 95% confidence interval, 1.30–2.92]), 31 (13%) with Solitaire (acOR, 1.90; 95% confidence interval, 0.97–3.73), 40 (17%) with other retrievable stents or mechanical devices (acOR, 0.96; 95% confidence interval, 0.51–3.93), and 38 (16%) could not be treated. There was no interaction between device and treatment effect on functional outcome and all other secondary and safety outcomes.

Conclusions—We found no evidence for a differential effect of thrombectomy for acute ischemic stroke by type of stent.


(Stroke. 2016;47:2574-2581. DOI: 10.1161/STROKEAHA.116.013929.)

Key Words: cerebral hemorrhage ■ infarction ■ odds ratio ■ reperfusion ■ stroke
extent to which these properties are important in clinical practice and whether they lead to better clinical outcomes is unknown. Experience with different stent types has led researchers and interventionists express the opinion that one type of stent may cause more damage to the vessel wall than the other. The apparently smaller treatment effect and rate of revascularization in MR CLEAN have been attributed to the type of stent used in this trial, instead of other factors, such as broader inclusion criteria.8

The aim of this post hoc study is to explore the differences in functional outcome, neurological recovery, extent of infarction, and adverse events according to treatment type and modality within the framework of the MR CLEAN trial.

Methods

Study Design and Participants

Patient eligibility and methods of MR CLEAN have been reported previously. In short, MR CLEAN was a randomized clinical trial of intra-arterial treatment versus no intra-arterial treatment in patients with a proximal intracranial arterial occlusion in the anterior circulation demonstrated on vessel imaging and treatable within 6 hours after symptom onset. In almost all treated patients, retrievable stents were used as a first approach.

Treatment Modalities

Intra-arterial treatment was categorized by the first treatment modality used. This could be (1) Trevo retrievable stent, (2) Solitaire retrievable stent, (3) other types of stent or mechanical devices or intra-arterial thrombolytics, and (4) no treatment or mechanical device. Treatment modalities or stent types used in <10% of patients included (1) Trevo retrievable stent, (2) Solitaire (Figure 1), (3) other types of stent or mechanical devices or intra-arterial thrombolytics, and (4) no treatment or mechanical device. This could be (1) Trevo retrievable stent, (2) Solitaire, (3) other types of stent or mechanical devices or intra-arterial thrombolytics, and (4) no treatment or mechanical device. Treatment modalities or stent types used in <10% of patients included aspiration or clot disruption with the guidewire (3/40, 7.5%), CAPTURE device (1/40, 2.5%), CATCH device (11/40, 27.5%), Lazarus device (1/40, 2.5%), MERCI device (2/40, 5.0%), Penumbra 3D device (1/40, 2.5%), REVIVE device (19/40, 47.5%), and unspecified retrievable stents (2/40, 5%).

In 24 patients (10.3%), a second treatment modality was used. This happened in 11 of 124 patients treated with Trevo (8.9%), in 1 of 30 patients treated with Solitaire (3.2%), and in 12 of 40 (30%) patients treated with other devices (P<0.001).

Baseline Characteristics

Of the 500 patients included in the trial, 233 were allocated to intervention. Baseline characteristics were distributed evenly over subgroups defined by treatment modality (Table 1). Moderate to good collaterals were seen more often in patients treated with the Trevo device (83/124, 67%), but this was not statistically significant in comparison with all other treatment subgroups (68/109, 62%, P=0.53) or with the Solitaire subgroup (17/31, 55%, P=0.19). Time to groin was 25 to 30 minutes longer in the Solitaire compared with the Trevo or other treatment modalities, but the difference was not statistically significant. General anesthesia was used more often in Trevo-treated patients than those treated with the Solitaire (P=0.10).

Effect on the Primary Outcome by Treatment Modality

The overall effect of intervention on the primary outcome was positive; the common odds ratio (cOR) was 1.66 (95% confidence interval [CI], 1.21–2.28); after adjustment for age, NIHSS, and collateral score, the adjusted common odds ratio (aOR) was 1.74 (95% CI, 1.26–2.41). In the group of 124 (53%) patients who were first treated with Trevo, the aOR was 1.98 (95% CI, 1.30–2.92) and among the 31 (13%) patients who were treated with Solitaire, the aOR was 1.90 (95% CI, 0.97–3.73; Table 2). In the 40 (17%) patients treated with other retrievable stents or mechanical devices, the aOR was 0.96 (95% CI, 0.51–1.73). There was no statistically significant interaction between device and effect on the primary outcome (Solitaire P=0.42, other devices P=0.06). The distribution of primary outcomes was similar for Trevo and Solitaire (Figure 1).
Table 1. Baseline Characteristics According to Treatment Modality and Stent Type

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Trevo</th>
<th>Solitaire</th>
<th>Other</th>
<th>None</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>n (%)</strong></td>
<td>267 (100%)</td>
<td>124 (53.2%)</td>
<td>31 (13.3%)</td>
<td>40 (17.2%)</td>
<td>38 (16.3%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>Age (med, IQR)</strong></td>
<td>65.7 (20.8)</td>
<td>65.8 (21.4)</td>
<td>69.6 (15.2)</td>
<td>61.5 (25.5)</td>
<td>63.6 (17.9)</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>Male sex (n, %)</strong></td>
<td>157 (58.8%)</td>
<td>72 (58.1%)</td>
<td>16 (51.6%)</td>
<td>23 (57.5%)</td>
<td>24 (63.2%)</td>
<td>0.91</td>
</tr>
<tr>
<td><strong>History</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Previous stroke</strong></td>
<td>25 (9.4%)</td>
<td>18 (14.5%)</td>
<td>5 (16.1%)</td>
<td>4 (10%)</td>
<td>2 (5.3%)</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>Diabetes mellitus II</strong></td>
<td>34 (12.7%)</td>
<td>18 (14.5%)</td>
<td>4 (12.9%)</td>
<td>4 (10%)</td>
<td>8 (21.1%)</td>
<td>0.64</td>
</tr>
<tr>
<td><strong>Atrial fribillation</strong></td>
<td>69 (25.3%)</td>
<td>38 (30.7%)</td>
<td>11 (35.5%)</td>
<td>10 (25%)</td>
<td>7 (18.4%)</td>
<td>0.46</td>
</tr>
<tr>
<td><strong>Myocardial infarction</strong></td>
<td>42 (15.7%)</td>
<td>15 (12.1%)</td>
<td>5 (16.1%)</td>
<td>7 (17.5%)</td>
<td>6 (15.8%)</td>
<td>0.88</td>
</tr>
<tr>
<td><strong>Peripheral arterial disease</strong></td>
<td>16 (6.0%)</td>
<td>5 (4.0%)</td>
<td>2 (6.5%)</td>
<td>1 (2.5%)</td>
<td>0 (0%)</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td>129 (48.3%)</td>
<td>56 (45.2%)</td>
<td>15 (48.4%)</td>
<td>8 (21.1%)</td>
<td>12 (31.6%)</td>
<td>0.29</td>
</tr>
<tr>
<td><strong>Hypercholesterolemia</strong></td>
<td>71 (26.6%)</td>
<td>29 (23.4%)</td>
<td>13 (41.9%)</td>
<td>7 (17.5%)</td>
<td>9 (23.4%)</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Physical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NIHSS (med, iqr)</strong></td>
<td>18 (8)</td>
<td>18 (7)</td>
<td>17 (6)</td>
<td>18 (6.5)</td>
<td>17 (10)</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>Systolic BP, mm Hg</strong></td>
<td>143 (32)</td>
<td>144.5 (30)</td>
<td>140 (33)</td>
<td>145 (26)</td>
<td>138.5 (35)</td>
<td>0.90</td>
</tr>
<tr>
<td><strong>Diastolic BP, mm Hg</strong></td>
<td>80 (20)</td>
<td>80 (2)</td>
<td>82 (14)</td>
<td>80 (20)</td>
<td>79 (18)</td>
<td>0.68</td>
</tr>
<tr>
<td><strong>Neuroimaging</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ASPECTS 0 to 4</strong></td>
<td>19 (7.2%)</td>
<td>6 (4.8%)</td>
<td>1 (3.2%)</td>
<td>3 (7.7%)</td>
<td>1 (2.6%)</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>ASPECTS 5 to 7</strong></td>
<td>39 (14.8%)</td>
<td>35 (28.2%)</td>
<td>7 (22.6%)</td>
<td>6 (15.4%)</td>
<td>6 (15.8%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>ASPECTS 8 to 10</strong></td>
<td>206 (78.0%)</td>
<td>83 (66.9%)</td>
<td>23 (74.2%)</td>
<td>30 (76.9%)</td>
<td>31 (81.6%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>Location on CTA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ICA</strong></td>
<td>3 (1.1%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1 (2.6%)</td>
<td>0.77</td>
</tr>
<tr>
<td><strong>ICA-T</strong></td>
<td>75 (28.2%)</td>
<td>35 (28.2%)</td>
<td>8 (25.8%)</td>
<td>11 (27.5%)</td>
<td>5 (13.2%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>M1</strong></td>
<td>165 (62.0%)</td>
<td>81 (68.3%)</td>
<td>20 (64.5%)</td>
<td>25 (62.5%)</td>
<td>28 (73.7%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>M2</strong></td>
<td>21 (7.9%)</td>
<td>8 (6.5%)</td>
<td>3 (9.7%)</td>
<td>3 (7.5%)</td>
<td>4 (10.5%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>A2</strong></td>
<td>2 (0.8%)</td>
<td>0</td>
<td>0</td>
<td>1 (2.5%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Collateral score on CTA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Absent</strong></td>
<td>17 (6.5%)</td>
<td>5 (4.1%)</td>
<td>1 (3.2%)</td>
<td>1 (2.5%)</td>
<td>2 (5.4%)</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>64 (24.3%)</td>
<td>35 (28.5%)</td>
<td>13 (41.9%)</td>
<td>14 (35.0%)</td>
<td>9 (24.3%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>111 (42.2%)</td>
<td>44 (35.8%)</td>
<td>10 (32.3%)</td>
<td>17 (42.5%)</td>
<td>17 (46.0%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>Good</strong></td>
<td>71 (27.0%)</td>
<td>39 (31.7%)</td>
<td>7 (22.6%)</td>
<td>8 (20.0%)</td>
<td>9 (24.3%)</td>
<td>...</td>
</tr>
<tr>
<td><strong>Logistics and treatment details</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time to CTA</strong></td>
<td>158 (81)</td>
<td>172 (37)</td>
<td>149 (78)</td>
<td>157 (89)</td>
<td>118 (63)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Time to randomization</strong></td>
<td>196 (117)</td>
<td>217.5 (106.5)</td>
<td>191 (64)</td>
<td>200 (107)</td>
<td>173 (78)</td>
<td>0.32</td>
</tr>
<tr>
<td><strong>Time to start IAT</strong></td>
<td>...</td>
<td>270 (105)</td>
<td>243 (76)</td>
<td>275 (112)</td>
<td>246 (54)</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>tPA pretreatment</strong></td>
<td>242 (90.6%)</td>
<td>108 (87.1%)</td>
<td>24 (77.4%)</td>
<td>35 (87.5%)</td>
<td>36 (94.8%)</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>General anesthesia</strong></td>
<td>...</td>
<td>41 (33.1%)</td>
<td>5 (16.1%)</td>
<td>28 (70.0%)</td>
<td>5 (23.8%)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

ASPECTS indicates Alberta Stroke Program Early CT Score; BP, blood pressure; CTA, computed tomographic angiography; IAT, intra-arterial treatment; ICA, intracranial carotid artery (nonterminus); ICA-T, intracranial carotid artery with involvement of the proximal middle cerebral artery segment; IQR, interquartile range; NIHSS, National Institutes of Health Stroke Scale; and tPA, tissue-type plasminogen activator.

Effect on the Secondary Outcomes
The proportions of patients with favorable scores on the Barthel Index at 90 days, the NIHSS scores at 24 hours and 5 to 7 days, were similar for each treatment modality (Table I in the online-only Data Supplement). Of the neuroimaging outcomes, infarct volume and absence of occlusion on CTA were similarly distributed, again without interaction. The proportion of patients with mTICI score 2b/3 was lower for patients treated with other mechanical devices than for patients treated with Solitaire or Trevo, but the difference was
not significant (Figure 2). Treatment effects for clinical and neuroimaging outcomes were similar for Trevo and Solitaire and seemed worse for other devices, but there was no statistically significant interaction (Table 2), except for persistence of occlusion on CTA, which was seen less often after treatment with Trevo (p=0.01) and Solitaire devices (p=0.03). Finally, no interaction was seen between stent type and general anesthesia or center on outcome (data not shown).

Safety Outcomes
Rates of any symptomatic intracerebral hemorrhage did not vary significantly by device type and in comparison with controls. The rate of deaths within 7 days and 3 months was increased for patients treated with other devices (11/40, 27.5% to 16/40, 40.0%), and this was statistically significant (Table 3). No statistically significant differences in occurrence of parenchymal hematoma types 1 and 2 and of new infarct in different territory were noted.

Timing and Work Flow
We estimated time to successful reperfusion, which was defined as mTICI 2b/3. We noted no differences in time from start of the treatment to reperfusion between patients treated with Trevo and those treated with Solitaire (−2 minutes,
or other devices (+12 minutes, \( P=0.07 \)). The median number of attempts was 2. We did not note any difference in number of attempts between Trevo, Solitaire, and other mechanical devices (\( P=0.91 \), Fisher exact).

### Discussion

We explored functional outcome, neurological recovery, reperfusion, extent of infarction, and adverse events according to stent type and make, within the framework of the MR CLEAN trial. Our study suggests that the 2 most commonly used stents, Trevo and Solitaire, perform equally well. We observed no statistically or clinically significant differences in effect on functional outcome, neurological recovery, recanalization, final infarct volume, or adverse events. Effectiveness and safety should, therefore, not be an argument in the choice of these devices.

### Other Studies

The large majority of other randomized trials of stent thrombectomy have predominantly used one particular device. We found one other study that directly compared the performance of different stent types.\(^{14}\) However, it included only 33 patients, and therefore lacked precision. A recent systematic review of revascularization and functional outcomes by stent type also found no significant differences between studies using Trevo and studies using Solitaire. Studies that used only one type

### Table 3. Safety Parameters by Treatment Modality

<table>
<thead>
<tr>
<th></th>
<th>Control, ( n=267 ) (%)</th>
<th>Trevo, ( n=124 ) (%)</th>
<th>Solitaire, ( n=31 ) (%)</th>
<th>Other, ( n=40 ) (%)</th>
<th>None, ( n=38 ) (%)</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical events</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptomatic intracerebral hemorrhage</td>
<td>17 (6.4)</td>
<td>9 (7.3)</td>
<td>3 (9.7)</td>
<td>3 (7.5)</td>
<td>3 (7.9)</td>
<td>0.90</td>
</tr>
<tr>
<td>Death within 7 d</td>
<td>27 (10.1)</td>
<td>12 (9.7)</td>
<td>5 (16.1)</td>
<td>11 (27.5)</td>
<td>5 (13.2)</td>
<td>0.04</td>
</tr>
<tr>
<td>Death within 1 mo</td>
<td>49 (18.4)</td>
<td>18 (14.5)</td>
<td>7 (22.6)</td>
<td>13 (32.5)</td>
<td>6 (15.8)</td>
<td>0.15</td>
</tr>
<tr>
<td>Death within 90 d</td>
<td>59 (22.1)</td>
<td>19 (15.3)</td>
<td>7 (22.6)</td>
<td>16 (40.0)</td>
<td>7 (18.4)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Radiological findings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subarachnoid hemorrhage</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>2 (5.0)</td>
<td>0 (0)</td>
<td>0.02</td>
</tr>
<tr>
<td>Parenchymal hemorrhage type 1</td>
<td>15 (5.9)</td>
<td>15 (12.4)</td>
<td>4 (12.9)</td>
<td>1 (2.5)</td>
<td>0 (0)</td>
<td>1.0</td>
</tr>
<tr>
<td>Parenchymal hemorrhage type 2</td>
<td>21 (8.2)</td>
<td>11 (9.1)</td>
<td>1 (3.2)</td>
<td>2 (5.0)</td>
<td>4 (10.5)</td>
<td>0.79</td>
</tr>
<tr>
<td>New infarct in different territory</td>
<td>13 (4.9)</td>
<td>15 (12.1)</td>
<td>2 (6.5)</td>
<td>5 (12.5)</td>
<td>1 (2.6)</td>
<td>0.14</td>
</tr>
<tr>
<td><strong>Procedural events (DSA)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vasospasm</td>
<td>…</td>
<td>49 (39.5)</td>
<td>10 (32.3)</td>
<td>14 (35.0)</td>
<td>…</td>
<td>0.75</td>
</tr>
<tr>
<td>Vessel perforation</td>
<td>…</td>
<td>0 (0)</td>
<td>1 (3.2)</td>
<td>1 (2.5)</td>
<td>…</td>
<td>0.13</td>
</tr>
<tr>
<td>New clot in different vascular territory</td>
<td>…</td>
<td>17 (13.7)*</td>
<td>1 (3.2)</td>
<td>2 (5.0)</td>
<td>…</td>
<td>0.14</td>
</tr>
</tbody>
</table>

\( DSA \) indicates digital subtraction angiography.

*In 3 cases, the embolism occurred before the attempted mechanical thrombectomy, and in 2, it could be attributed to the second device that was used in the procedure.
of device were included in the review. No within study compar-
isons and no adjustments for prognostic factors could be
made.15

Previously, comparisons have been made of retrievable
stents with the first generation devices.16–18 The observation
that both the Solitaire and the Trevo outperformed the first
generation devices, corroborates our findings.17,18

Limitations
The MR CLEAN trial was not designed for the purpose of
comparing device types. The baseline characteristics
and prognostic factors were well balanced between the 2 mos-
testingly used stent types; this suggests that systematic bias
is negligible. The findings in the category other devices are
difficult to interpret. The experience of the interventionists
with these relatively new devices was probably limited; more-
over, confounding by indication may have played a role. From
these data, it cannot be readily concluded that other devices
are inferior to the 2 most commonly used retrievable stents.
Our study does not provide a definite answer to the question
“is any device for thrombectomy better than another one?”
because (1) our study was not powered to analyze the dif-
fences in outcome according to device type, (2) the comparison
was not randomized, and (3) the data stem from a trial set-
ning and not from the real world. In our opinion, however, MR
CLEAN was a trial that approached the real world as close as
possible, whereas real-world data often do not provide a clear-
cut comparison that is easy to interpret.

Overall Conclusions
In this randomized clinical trial of endovascular thrombec-
tomy versus usual care for patients with acute ischemic stroke
caused by proximal intracranial occlusion, we found no evi-
dence for a differential treatment effect by stent type or make.

Appendix: The MR CLEAN Investigators

Executive Committee: Diederik W.J. Dippel, Department of
Neurology, Erasmus MC University Medical Center, Rotterdam, The
Netherlands; Aad van der Lugt, Department of Radiology, Erasmus
MC University Medical Center, Rotterdam, The Netherlands; Charles
B.L.M. Majoie, Department of Radiology, Academic Medical Center,
Amsterdam, The Netherlands; Yvo B.W.E.M. Roos, Department of
Neurology, Academic Medical Center, Amsterdam, The Netherlands;
Paul J. Nederkoorn, Department of Neurology, Academic Medical
Center, Amsterdam, The Netherlands; Marijeke J.H. Wermers, Department of Neurology, Leiden
University Medical Center, The Netherlands; Marianne A.A. van
Walderven, Department of Radiology, Leiden University Medical
Center, The Netherlands; Robert J. van Oostenbrugge, Department of
Neurology, Maastricht University Medical Center and Cardiovascu-
ar Research Institute Maastricht (CARIM), The Netherlands; Wim H.
van Zwam, Department of Radiology, Maastricht University Medical
Center and Cardiovascular Research Institute Maastricht (CARIM), The Netherlands; Julie Staals, Department of Neurology, Maastricht
University Medical Center and Cardiovascular Research Institute
Maastricht (CARIM), The Netherlands; Jeannette Hofmeijer, Department of Neurology, Rijnstate Hospital, Arnhem, The
Netherlands; Jacques A. van Oostayen, Department of Radiology,
Rijnstate Hospital, Arnhem, The Netherlands; Geert J. Lycklama à
Nijeholt, Department of Radiology, MC Haaglanden, the Hague, The
Netherlands; Jelis Boiten, Department of Neurology, MC Haaglanden,
the Hague, The Netherlands; Diederik W.J. Dippel, Department of
Neurology, Erasmus MC University Medical Center, Rotterdam, The
Netherlands; Patrick A. Brouwer, Department of Radiology, Erasmus
MC University Medical Center, Rotterdam, The Netherlands; Bart J.
Emmer, Department of Radiology, Erasmus MC University Medical
Center, Rotterdam, The Netherlands; Sebastiaan F. de Bruijn,
Department of Neurology, HAGA Hospital, the Hague, The
Netherlands; Lukas C.W. Meijer, Department of Radiology, Atrium
Medical Center, the Hague, The Netherlands; L. Jaap Kappelle, Department of Neurology, University Medical Center Utrecht, Utrecht, The
Netherlands; Rob H. Lo, Department of Radiology, University Medical Center Utrecht, Utrecht, The Netherlands; Ewoud J. van Dijk,
Department of Neurology, Radboud University Medical Center, Nijmegen, The Netherlands; Joost de Vries, Department of Neurosurgery, Radboud University Medical Center, Nijmegen, The
Netherlands; Paul L.M. de Kort, Department of Neurology, Sint
Elisabeth Hospital, Tilburg, The Netherlands; Jan S.P. van den Berg,
Department of Neurology, Isala Klinieken, Zwolle, The Netherlands;
Boudewijn A.A.M. van Hasselt, Department of Radiology, Isala
Klinieken, Zwolle, The Netherlands; Leo A.M. Aerden, Department of Neurology, Reineur de Graaf Gasthuis, Delft, The
Netherlands; René J. Dallinger, Department of Radiology, Reineur de Graaf Gasthuis, Delft, The Netherlands; Marie C. Visser, Department of Neurology, VU
Medical Center, Amsterdam, The Netherlands; Joseph C.J. Bot, Department of Radiology, VU Medical Center, Amsterdam, The
Netherlands; Patrick C. Vroemen, Department of Neurology, University Medical Center Groningen, The Netherlands; Omid
Eshghi, Department of Radiology, University Medical Center Groningen, The Netherlands; Tobien H.C. M.L. Schreuder, Department of
Neurology, Atrium Medical Center, Heerlen, The Netherlands; Roel
J.J. Heijboer, Department of Radiology, Atrium Medical Center,
Heerlen, The Netherlands; Koos Keizer, Department of Neurology,
Catharina Hospital, Eindhoven, The Netherlands; Alexander V.
Tielbeek, Department of Radiology, Catharina Hospital, Eindhoven,
The Netherlands; Heleen M. den Hertog, Department of Neurology,
Medical Spectrum Twente, Enschede, The Netherlands; Dick G.
Gerrits, Department of Radiology, Medical Spectrum Twente,
Enschede, The Netherlands; Renske M. van den Berg-Vos, Department of Neurology, Sint Lucas Andreas Hospital, Amsterdam, The
Netherlands; Giorgos B. Karas, Department of Radiology, Sint Lucas
Andreas Hospital, Amsterdam, The Netherlands. Imaging Assessment
Committee: Charles B.L.M. Majoie (Chair), Department of Radiology,
Academic Medical Center, Amsterdam, The Netherlands; Wim H.
van Zwam, Department of Radiology, Maastricht University Medical
Center and Cardiovascular Research Institute Maastricht (CARIM), The Netherlands; Aad van der Lugt, Department of Radiology,
Erasmus MC University Medical Center, Rotterdam, The Netherlands;
Geert J. Lycklama à Nijeholt, Department of Radiology, MC Haaglanden, the Hague, The Netherlands; Marianne A.A. van
Walderven, Department of Radiology, Leiden University Medical
Center, The Netherlands; Joseph C.J. Bot, Department of Radiology,
SOURCES OF FUNDING

MR CLEAN trial (Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands) was partly funded by the Dutch Heart Foundation and by unrestricted grants from AngioCare BV, Medtronic/Covidien/EV3, MEDDAC Gmbh/LAMEPRO, Penumbra Inc, Stryker, and Top Medical/Concentric.

DISCLOSURES

Erasmus MC received funds from Stryker and Bracco Imaging for consultations by Dr Dippel. The Academic Medical Center received funds from Stryker for consultations by Drs Majoie, Roos, and Berkhemer. The Maasstricht University Medical Center received funds from Stryker for consultations by Dr Dippel. The Academic Medical Center received funds from Stryker for consultations by Dr van Zwan.

REFERENCES


Influence of Device Choice on the Effect of Intra-Arterial Treatment for Acute Ischemic Stroke in MR CLEAN (Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands)

Diederik W. Dippel, Charles B. Majoie, Yvo B. Roos, Aad van der Lugt, Robert J. van Oostenbrugge, Wim H. van Zwan, Hester F. Lingsma, Peter J. Koudstaal, Kilian M. Treurniet, Lucie A. van den Berg, Debbie Beumer, Puck S. Fransen, Olvert A. Berkhemer and for the MR CLEAN Investigators

Stroke. 2016;47:2574-2581; originally published online September 6, 2016;
doi: 10.1161/STROKEAHA.116.013929

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2016 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/47/10/2574

Data Supplement (unedited) at:
http://stroke.ahajournals.org/content/suppl/2016/09/15/STROKEAHA.116.013929.DC1

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org/subscriptions/
**Table I: Secondary outcomes by treatment modality**

<table>
<thead>
<tr>
<th></th>
<th>Control (N=267)</th>
<th>Trevo (N=124)</th>
<th>Solitaire (N=31)</th>
<th>Other (N=40)</th>
<th>None (N=38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Rankin Scale 0 to 2</td>
<td>51 (19.1%)</td>
<td>42 (33.9%)</td>
<td>10 (32.3%)</td>
<td>11 (27.5%)</td>
<td>13 (34.2%)</td>
</tr>
<tr>
<td>Barthel index 19 to 20</td>
<td>73 (30.2%)</td>
<td>52 (45.2%)</td>
<td>14 (48.3%)</td>
<td>16 (43.2%)</td>
<td>17 (50.0%)</td>
</tr>
<tr>
<td>NIHSS score at 24 hrs*</td>
<td>16.1 (7.5)</td>
<td>13.4 (8.6)</td>
<td>12.8 (8.3)</td>
<td>15.4 (8.4)</td>
<td>12.2 (10.1)</td>
</tr>
<tr>
<td>NIHSS score at 5-7 days*</td>
<td>13.0 (7.9)</td>
<td>9.9 (8.4)</td>
<td>8.6 (6.5)</td>
<td>10.7 (7.9)</td>
<td>10.1 (9.5)</td>
</tr>
<tr>
<td>Infarct volume at 5 to 7 days</td>
<td>93.4 (73.5)</td>
<td>75.6 (76.2)</td>
<td>66.8 (58.7)</td>
<td>78.7 (83.7)</td>
<td>61.9 (71.2)</td>
</tr>
<tr>
<td>mTICI 2b/3</td>
<td>-</td>
<td>80 (64.5%)</td>
<td>19 (61.3%)</td>
<td>16 (40.0%)</td>
<td>-</td>
</tr>
<tr>
<td>No occlusion on CT at 24 hrs</td>
<td>68 (32.9%)</td>
<td>84 (80.8%)</td>
<td>20 (83.3%)</td>
<td>21 (70.0%)</td>
<td>16 (55.1%)</td>
</tr>
</tbody>
</table>

* Mean (SD);