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## ***Research Article***

# **Impact of recanalization by mechanical thrombectomy in mild acute ischemic stroke with large anterior vessel occlusion.**

**Short Title: Mechanical thrombectomy for mild strokes of anterior circulation**

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## 1 **Abstract**

2 **Background:** The net clinical benefit of mechanical thrombectomy (MT) in patients presenting  
3 acute anterior circulation ischemic stroke with large-vessel occlusion (AIS-LVO) and mild  
4 neurological deficit is uncertain.

5 **Aims:** To investigate efficacy and safety of MT in patients with acute AIS-LVO and mild  
6 neurological deficit by evaluating *i*) the influence of recanalization on three-month outcome and  
7 *ii*) mortality, symptomatic intracerebral hemorrhage (sICH) and procedural complications.

8 **Methods:** We included consecutive patients with acute AIS-LVO and National Institutes of  
9 Stroke Scale (NIHSS) score <8, treated by MT at Lille University Hospital. Recanalization was  
10 graded according to modified Thrombolysis in Cerebral Infarction (mTICI) score, mTICI 2b/2c/3  
11 being considered successful. We recorded procedural complications and classified intra-cerebral  
12 hemorrhages (ICH) and sICH according with European Cooperative Acute Stroke Study  
13 (ECASS) and ECASS2 criteria. Three-month outcome was evaluated by modified Rankin scale  
14 (mRS). Excellent and favorable outcomes were respectively defined as mRS 0-1 and 0-2 (or  
15 similar to pre-stroke).

16 **Results:** We included 95 patients. At three months, 56 patients (59.0%) achieved an excellent  
17 outcome and 69 (72.6%) a favorable outcome, both being more frequent in patients with  
18 successful recanalization than in patients without (excellent outcome 71, 1% versus 10, 5%,  
19  $p < 0.001$  and favorable outcome 82.9% versus 31.6%,  $p < 0.001$ ). The difference remained  
20 unchanged after adjustment for age and pre-MT infarct volume. Similar results were observed in  
21 patients with pre-MT NIHSS  $\leq 5$ . Death occurred in five patients (5.3%), procedural  
22 complications in 12 (12.6%), any ICH in 38 (40.0%), including 3 (3.2%) sICH.

23 **Conclusions:** Achieving successful recanalization appears beneficial and safe in acute AIS-LVO  
24 patients with NIHSS <8 before MT.

## 25 1. **Introduction**

26 Mechanical thrombectomy (MT) is the standard of care for patients presenting anterior  
27 circulation acute ischemic stroke with large-vessel occlusion (AIS-LVO). Nevertheless, efficacy  
28 and safety of MT in patients with AIS-LVO and minor-to-mild neurological deficit remain  
29 uncertain. Indeed, patients with low National Institutes of Stroke Scale (NIHSS) score were  
30 excluded from landmark randomized clinical trials in which the results were geared toward  
31 clinically severe stroke. Consistently, the metanalysis performed by Goyal et al. did not show a  
32 statistically significant benefit in patients with NIHSS  $\leq 10$ , limiting firm conclusions about the  
33 net clinical benefit of MT in these patients [1]. Moreover, patients with a NIHSS score  $< 8$  were  
34 not included in the SWIFT-PRIME trial and were lightly represented in the other randomized  
35 trials, limiting firm conclusions in this specific subgroup of patients. In patients with minor  
36 (NIHSS  $\leq 5$ ) to mild (NIHSS  $< 8$ ) neurological deficit, intravenous thrombolysis (IVT) is safe  
37 and improves outcome, suggesting a positive effect of recanalization [2]. However, the rate of  
38 successful recanalization after IVT in large vessel occlusion is low [3] and observational studies  
39 suggested that MT, in addition to best medical treatment (BMT), could be safe and effective in  
40 patients with AIS-LVO and mild neurological deficit [4–7].

41 The aim of our study was to evaluate efficacy and safety of MT in AIS-LVO patients with mild  
42 neurological deficit before MT by evaluating *i*) the influence of successful recanalization after  
43 MT on vital and functional outcome at month-3 and *ii*) the rate of sICH and procedural  
44 complications.

## 45 2. **Methods**

### 46 2.1. *Setting*

47 We included patients from the Lille reperfusion registry, which is an ongoing observational registry of  
48 consecutive patients from the 16 hospitals included in the North-of-France stroke network treated by  
49 MT. The organization of stroke care in the 16 hospitals of the network has been previously described  
50 [8].

### 51 2.2. *Inclusion and exclusion criteria*

52 We included all consecutive patients (no upper age limit) between January 1<sup>st</sup> 2015 and July 31<sup>st</sup> 2018,  
53 with acute AIS-LVO, presenting with NIHSS<8 immediately before MT and persistent LVO on pre-  
54 treatment digital subtraction angiography (DSA). We decided to exclude patients recanalized  
55 (spontaneously or after intravenous thrombolysis (IVT)) on pre-therapeutic imaging in order to  
56 evaluate the risk/benefit profile of recanalization obtained by MT. Patients were either directly  
57 admitted to the Lille University Hospital where the MT center is located, according to the mothership  
58 model, or referred from another hospital, according to the drip and ship model [8].

### 60 2.3. *Baseline clinical data and eligibility criteria acute treatments*

61 We prospectively collected the following demographic characteristics and vascular risk factors, as  
62 previously defined [8,9]: age, gender, arterial hypertension, diabetes mellitus, hypercholesterolemia,  
63 smoking (previous or current), excessive alcohol consumption, history of myocardial infarction (MI)  
64 and stroke or transient ischemic attack (TIA), previous or current atrial fibrillation (AF),  
65 antithrombotic medication prior to stroke, pre-stroke modified Rankin Scale score (mRS). We  
66 recorded whether patients were directly admitted or referred from remote hospitals. We assessed  
67 NIHSS immediately before MT and 24 hours later. Patients eligible for IVT were treated according to  
68 the European Stroke Organisation recommendations [10]. Eligibility criteria for MT were evidence of  
69 AIS-LVO on magnetic resonance imaging (MRI) angiography sequences at baseline (or on computed  
70 tomographic angiography (CTA) in case of contra-indication for MRI) and possibility to start MT

71 within eight hours after stroke recognition. After the publications of the results of the DEFUSE 3 and  
72 DAWN trials, we extended the time-window up to 24 hours from last known normal and selected the  
73 patients according to trial criteria [11,12]. MT was initiated as soon as possible after the end of  
74 imaging and performed by a trained neuroradiologist, under conscious sedation, by trans-femoral  
75 approach. We recorded: *i*) time from symptom recognition to puncture; *ii*) time from symptom  
76 recognition to first imaging (last slice); *iii*) time from first imaging to puncture; *iv*) time from  
77 symptom recognition to recanalization for patients with successful recanalization after MT; *v*) time  
78 from groin puncture to recanalization. Stroke etiology was classified according to TOAST criteria.

#### 79 80 *2.4. Baseline radiological assessment*

81 All patients underwent MRI at admission (with fluid attenuation inversion recovery [FLAIR] and  
82 gradient echo T2\* sequences, b1000 diffusion weighed imaging (DWI) with apparent diffusion  
83 coefficient (ADC) mapping, and time-of-flight magnetic resonance angiography [MRA]). Those with  
84 a contra-indication for MRI underwent a CT-scan. All patients underwent another MRI (or CT)-scan  
85 22 to 36 hours after treatment, or earlier in case of clinical worsening. A senior neuroradiologist  
86 analyzed all images (MRI, CT, DSA), blinded to clinical data. Infarct volumes were assessed using a  
87 semi-automated software (OLEA sphere 3.0) on the last brain imaging performed before MT. Site of  
88 occlusion was determined on pre-treatment DSA: M1 middle cerebral artery (MCA) occlusion, M2  
89 MCA occlusion, terminal internal carotid artery (ICA) and tandem occlusion. We defined successful  
90 recanalization as mTICI score 2b, 2c or 3.

#### 91 92 93 *2.5. Outcome assessment*

94 Outcome at month-3 was evaluated using the mRS score. An excellent outcome was defined as an  
95 mRS score 0-1 or similar to the pre-stroke mRS, a favorable outcome as an mRS score 0-2 or similar  
96 to the pre-stroke mRS. Procedural complications were collected, including device-related

97 complications (subarachnoidal hemorrhage, carotido-cavernous fistula), puncture-site problems  
98 (hematoma or occlusion), and embolization in other arterial territories.  
99 Intra-cerebral hemorrhages (ICHs) were classified on imaging performed at 22-36 hours using the  
100 European Cooperative Acute Stroke Study (ECASS) criteria [13] as hemorrhagic infarction (HI) and  
101 parenchymal hematoma (PH). Symptomatic ICH (sICH) was defined according to ECASS 2 criteria  
102 [14].

103 All-cause mortality rate was evaluated at three months.

104

## 105 *2.6. Statistical analysis*

106 Quantitative variables are expressed medians (interquartile range, IQR). Categorical variables are  
107 expressed as numbers (percentage). Normality of distributions was assessed using histograms and  
108 Shapiro-Wilk test. Patients were divided in two groups according to successful recanalization.  
109 Baseline characteristics were described according to study groups and importance of imbalances was  
110 assessed by calculating the absolute standardized differences (ASDs);  $ASD > 20\%$  were interpreted as  
111 meaningful imbalance. Comparison in binary outcomes between the two study groups were  
112 performed using chi-square test or Fisher's exact test and comparison in overall distribution of the  
113 month-3 mRS was performed using Mann-Whitney U test. Difference in binary outcomes were  
114 expressed as odds ratio (OR) calculated by penalized-likelihood logistic regression (to account for the  
115 small sample size) and the difference in month-3 mRS was expressed as common OR for 1-point  
116 improvement (after pooled together 5 and 6) [15]. Two sensitivity analyses for comparisons in  
117 functional outcomes were done, firstly in the subgroups of patients with MCA-M1 occlusion, and  
118 secondly, in the subgroup of patients with pre-treatment NIHSS score  $\leq 5$ . Main comparisons were  
119 further adjusted for pre-specified confounders (age and pre-treatment volume) using multivariable  
120 penalized-likelihood logistic regression models. Among patients with successful recanalization, we  
121 assessed the association of functional outcomes with both recanalization grades (mTICI 3 vs. 2b/2c)  
122 and time from groin puncture to successful recanalization (treated as a continuous variable and an  
123 ordinal variable according to the tertiles), using univariable penalized-likelihood logistic regression

124 models. Statistical testing was conducted at the two-tailed  $\alpha$ -level of 0.05. Data were analyzed using  
125 the SAS software version 9.4 (SAS Institute, Cary, NC).

126

127

### 128 3. Results

129 From January 1<sup>st</sup> 2015, to July 31<sup>st</sup> 2018, 922 consecutive patients with AIS-LVO were treated by MT.  
130 Among them, 106 had a NIHSS<8 at the first neurological examination of whom 33 patients had a  
131 neurological deterioration before thrombectomy (31%, see supplemental table for outcome  
132 description in this subgroup) and 73 had a pre-treatment NIHSS<8. From the 816 with a NIHSS $\geq$ 8 at  
133 the first neurological examination, only 22 patients had neurological improvement before  
134 thrombectomy (Fig. 1). Thus, 95 with pre-treatment NIHSS<8 were eligible and included in the  
135 present study—(flow chart in Fig. 1). Patient characteristics are described in Table 1. Seventy-six  
136 patients out of 95 (80%) achieved successful recanalization (n=36 with mTICI 2b/2c, n=40 with  
137 mTICI 3), with a median time of 293 minutes (IQR, 234 to 360) from symptom recognition to  
138 recanalization and of 26 minutes (IQR, 18 to 43 minutes) after groin puncture.

139

#### 140 3.1. Outcomes and Successful Recanalization

141 Overall, 56 (59.0%) patients achieved an excellent outcome and 69 (72.6%) a favorable outcome.  
142 Figure 2 shows the distribution of month-3 mRS scores according to recanalization status. Patients  
143 with successful recanalization were more likely to have both excellent and favorable outcome than  
144 patients without (Table 2). After adjustment for age and infarct volume, we found that successful  
145 recanalization remained significantly associated with both favorable and excellent outcome (Table 2).  
146 The positive associations persisted in the two sensitivity analyses restricted to: *i*) patients with M1  
147 MCA occlusion and *ii*) patients with pre-treatment NIHSS $\leq$  5 (Fig. 3).



148 Regarding safety outcomes, ICH occurred in 38 patients (40.0%), including eight PHs and three  
149 sICHs. Procedural complications occurred in 12 (12.6%) patients. The rate of complications in the  
150 group of patients with M2 occlusion was 11.5% (3/26). Details are reported in Table 1s (supplemental  
151 material). Five patients died (5.3%). Regarding safety outcome, there was no significant difference  
152 between patients with and without successful recanalization.

153

### 154 *3.2. Outcomes according to grade and delays of recanalization*

155 Although the difference did not reach statistical significance, patients with mTICI 3 score presented  
156 better functional outcomes than those with mTICI 2b (Fig. 4). We also observed a non-significant  
157 trend toward lower excellent and favorable outcomes rates with increasing time from groin puncture  
158 to recanalization (Fig. 4).

#### 159 4. Discussion

160 Our study has shown that among patients with mild neurological deficit treated with MT for AIS-  
161 LVO, about three-quarters had a favorable outcome and more than half had an excellent outcome at  
162 three months. The likelihood of achieving month-3 favorable/excellent outcome was strongly  
163 influenced by recanalization success: in case of recanalization failure, only one patient out of 10 had  
164 an excellent outcome and less than one-third had a favorable outcome. The benefit of recanalization  
165 on functional outcome was also observed in the subgroup of patients with the least severe clinical  
166 deficit (NIHSS $\leq$ 5). MT appeared to be safe with only 3% sICH and a three-month mortality rate of  
167 5%.

168 Our study has several strengths. Data were prospectively collected, with a pre-specified data  
169 collection protocol focusing on functional outcome and no exclusion due to missing data. The  
170 neuroradiological assessment was systematically performed on the last neuroimaging performed  
171 before MT. We only included patients with persistent occlusion on pre-treatment DSA to assess the  
172 impact of recanalization obtained by MT in patients with low NIHSS, in which clinicians have to  
173 balance the therapeutic decision of performing MT against bringing the additional risk of procedural  
174 complications. Baseline characteristics and mortality rates in our study were consistent with previous  
175 reports, re-ensuring about the generalizability of the results [16].

176 There are also several limitations. We analyzed data from a single-center cohort in a tertiary  
177 university hospital [8]. Moreover, we did not collect data on patients for whom we decided not to  
178 perform MT, enabling us only to compare patients with a successful recanalization after MT to  
179 patients with recanalization failure, but not MT treated patients with patients treated with BMT alone.  
180 Other limitations include the retrospective design and the relatively small sample size. Last, we did  
181 not evaluate either collaterality or perfusion, which could be of interest in patients with mild stroke  
182 and LVO [17].

183 Inconsistently with our results, previous observational studies [18–21], suggested that patients with  
184 acute AIS-LVO with minor-to-mild neurological deficit treated by MT had similar outcome compared

185 with patients treated by BMT, including IVT. Nevertheless, in these studies, the two groups of  
186 patients (MT vs. BMT) were substantially different, with higher proportion of proximal LVO (ICA or  
187 M1) in the group treated with MT and higher proportion of distal occlusion [19] (M2 to M4 and  
188 anterior cerebral artery) in the group treated with BMT [18]. Importantly, distal occlusions are per se  
189 associated with better outcome and higher chances to obtain a successful recanalization after IVT  
190 [18], with potential impact on results. Moreover, MT patients were treated later [20], with potential  
191 impact on outcome. In our study, despite differences at baseline on NIHSS and occlusion site between  
192 patients with recanalization versus without, sensitivity analysis and comparisons in functional  
193 outcomes allowed to confirm our results on the benefit of MT-obtained recanalisation on outcome in  
194 patients with MCA-M1 occlusion and with pre-treatment NIHSS score  $\leq 5$ . Other observational studies  
195 [4–6] and a recent meta-analysis [22] showed, accordingly with our results, that patients with AIS-  
196 LVO and minor/mild neurological deficit, treated with MT, achieved better functional outcomes  
197 compared to those treated with BMT.

198 We observed a strong influence of successful recanalization on outcome in acute AIS-LVO patients  
199 with minor/mild neurological deficit treated by MT, the best clinical benefit being achieved in case of  
200 complete recanalization. In our study, rates of excellent/favorable outcome were low (10% and 31%)  
201 in case of recanalization failure, and they were significantly higher in case of successful  
202 recanalization (71% and 83%, respectively). This is consistent with other reports showing similar  
203 rates of favorable/excellent outcome in patients with successful recanalization [21]. These results  
204 strongly suggest that the association between recanalization and outcome, clearly demonstrated in  
205 patients with severe deficit, also exists in patients with low NIHSS scores.

206 In line with our findings, previous observational studies [23,24] and a recent meta-analysis [25] found  
207 good safety profiles in patients with minor/mild neurological deficit treated with MT and similar rate  
208 of sICH compared to literature [23]. However, our procedural complication rate appeared higher than  
209 previously reported [24], likely because of the exhaustive definition we decided to use in this  
210 population of patients with minor/mild neurological deficit. Although there was no significant  
211 difference in safety outcomes in patients with and without successful recanalization, there was a

212 numerical difference between the two groups for procedural complications and symptomatic ICH.  
213 Indeed, in the subgroup of patients with recanalization failure, the MT procedure had to be aborted  
214 because of procedural complication in three cases versus no case in case of successful recanalization,  
215 which might have influenced the month-3 outcome. It is however impossible to determine whether  
216 procedural complications led to recanalization failure or recanalization failure led to more procedural  
217 complications. In accordance with a previous report [22], three-month mortality was very low.

218 **5. Conclusions**

219 Awaiting the results of on-going trials (IN EXTREMIS/MOSTE and ENDOLOW study), in MT  
220 treated patients with AIS-LVO and mild neurological deficit, recanalization could be safe and  
221 effective.

222 **6. Acknowledgements**

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224 collected part of the data.

225 **7. Statement of Ethics**

226 The institutional review board (Comité de protection des personnes Nord Ouest IV) classified the  
227 study as observational on March 9, 2010 and approved the study by December 21, 2010 (n° 10. 677).

228 Patients and their relatives gave their informed consent to participate.

229

230 **8. Disclosure statement**

231 Arnaud Karam, Julien Labreuche and Nicolas Bricout report no disclosures.

232 Barbara Casolla, Marc Ferrigno and Hilde Henon served as investigators for clinical trials (Astra-

233 Zeneca, Boehringer-Ingelheim, Daiichi-Sankyo, Pfizer). All fees were paid to ADRINORD or the

234 Lille University Hospital research account, no personal funding.

235 Charlotte Cordonnier served on advisory boards (Bayer, Medtronic, Daiichi-Sankyo) and as

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241

242 **10. Author contributions**

243 Arnaud Karam designed analyzed and interpreted all data and drafted the manuscript.

244 Barbara Casolla and Marc Ferrigno contributed to data collection, analyzed all data and revised the  
245 manuscript.

246 Julien Labreuche performed the statistical analyses.

247 Charlotte Cordonnier and Nicolas Bricout conceptualized and designed the study, interpreted study  
248 data, and revised the manuscript.

249 Hilde Hénon designed and conceptualized the study, analyzed and interpreted all data, and revised the  
250 manuscript.

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370 **12. Figure Legends**

371 **Figure 1.** Flow chart of the study

372 **Figure 2.** Distribution of modified Rankin Score (mRS) at 90 days, according to successful  
373 recanalization after mechanical thrombectomy.

374 NIHSS=National Institutes of Health Stroke Scale, mRS=modified Rankin Score.

375 **Figure 3.** Comparison in functional outcomes according to successful recanalization in sensitivity  
376 analyses restricted to patients with M1 middle cerebral artery occlusion or to patients with pre-treatment  
377 NIHSS $\leq$ 5. CI=confidence interval, NIHSS=National Institutes of Health Stroke Scale, MCA=middle  
378 cerebral artery, mRS=modified Rankin Score, mTICI=modified Thrombolysis in Cerebral Infarction  
379 scale, OR=odds ratio.

380 **Figure 4.** Excellent and favorable outcome according to delays and grade of recanalization.  
381 CI=confidence interval, mRS=modified Rankin Score, mTICI=modified treatment in cerebral infarction  
382 score, OR=odds ratio. OR calculated per 15 minutes increase in groin puncture to successful  
383 recanalization time (treated as continuous variable).

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394 **Table 1. Baseline characteristics of the study population, overall and according to**  
 395 **successful recanalization after mechanical thrombectomy.**

|  | Overall<br>(n=95)   | No (mTICI 0-2a)<br>(n=19) | Yes (mTICI2b/3)<br>(n=76) | ASD, % |
|--|---------------------|---------------------------|---------------------------|--------|
| <b>Demographic characteristics</b>             |                     |                           |                           |        |
| Age, years                                     | 69.0 (59.0 to 78.0) | 68.0 (61.0 to 80.0)       | 69.570 (58.5 to 76.57)    | 10.4   |
| Male gender                                    | 45 (47.4)           | 7 (36.8)                  | 38 (50.0)                 | 26.8   |
| <b>Medical history</b>                         |                     |                           |                           |        |
| Hypertension                                   | 61 (64.2)           | 17 (89.5)                 | 44 (57.9)                 | 76.8   |
| Diabetes mellitus                              | 16 (16.8)           | 3 (15.8)                  | 13 (17.1)                 | 3.6    |
| Hypercholesterolemia                           | 43 (45.3)           | 6 (31.6)                  | 37 (48.7)                 | 35.4   |
| Smoking (previous or current)                  | 39 (41.1)           | 6 (31.6)                  | 33 (43.4)                 | 24.7   |
| Excessive alcohol consumption                  | 13 (13.7)           | 1 (5.3)                   | 12 (15.8)                 | 34.8   |
| Previous MI                                    | 12 (12.6)           | 3 (15.8)                  | 9 (11.8)                  | 11.5   |
| Previous stroke or TIA                         | 15 (15.8)           | 6 (31.6)                  | 9 (11.8)                  | 49.3   |
| Previous or current AF                         | 30 (31.6)           | 7 (36.8)                  | 23 (30.3)                 | 14.0   |
| Antithrombotic medication prior to stroke      | 42 (44.2)           | 10 (52.6)                 | 32 (42.1)                 | 21.2   |
| Anticoagulant use                              | 19 (20.0)           | 4 (21.1)                  | 15 (19.7)                 | 3.3    |
| Antiplatelet use                               | 27 (28.4)           | 6 (31.6)                  | 21 (27.6)                 | 8.7    |
| <b>Stroke characteristics</b>                  |                     |                           |                           |        |
| Pre-stroke mRS > 0                             | 21 (22.1)           | 6 (31.6)                  | 15 (19.7)                 | 27.4   |
| NIHSS before MT                                | 5 (3 to 6)          | 6 (4 to 6)                | 5 (3 to 6)                | 32.7   |
| Direct admission                               | 25 (26.3)           | 6 (31.6)                  | 19 (25.0)                 | 14.7   |
| M1 MCA   | 48 (50.5)           | 14 (73.7)                 | 34 (44.7)                 | 89.1   |
| M2 MCA   | 26 (27.4)           | 1 (5.3)                   | 25 (32.9)                 |        |
| Intracranial ICA                               | 4 (4.2)             | 0 (0.0)                   | 4 (5.3)                   |        |
| Tandem   | 17 (17.9)           | 4 (21.1)                  | 13 (17.1)                 |        |
| Volume, ml <sup>1</sup>                        | 5.0 (2.0 to 11.0)   | 5.0 (2.0 to 7.0)          | 5.0 (2.6 to 11.0)         | 11.3   |
| Wake-up stroke                                 | 22 (23.2)           | 5 (26.3)                  | 17 (22.4)                 | 9.2    |
| Suspected stroke cause                         |                     |                           |                           |        |
| Large artery atherosclerosis                   | 17 (17.9)           | 3 (15.8)                  | 14 (18.4)                 | 20.4   |
| Cardioembolic                                  | 39 (41.1)           | 9 (47.4)                  | 30 (39.5)                 |        |
| Other  | 8 (8.4)             | 1 (5.3)                   | 7 (9.2)                   |        |
| Unknown  | 31 (32.6)           | 6 (31.6)                  | 25 (32.9)                 |        |
| <b>Treatments characteristics</b>              |                     |                           |                           |        |
| IVT  | 66 (69.5)           | 9 (47.4)                  | 57 (75.0)                 | 59.1   |
| General anesthesia                             | 1 (1.1)             | 0 (0.0)                   | 1 (1.3)                   | 16.3   |
| Time symptom recognition to puncture, min      | 262 (210 to 320)    | 266 (204 to 355)          | 261 (212 to 318)          | 5.5    |
| Time symptom recognition to first imaging, min | 126 (93 to 167)     | 119 (102 to 153)          | 126 (89 to 170)           | 9.3    |
| Time first imaging to puncture, min            | 92 (43 to 142)      | 51 (42 to 120)            | 95 (44 to 143)            | 25.9   |

396 Values are expressed as number (%) or median (Interquartile range). AF=atrial fibrillation; ASD=absolute  
 397 standardized difference; ICA=internal carotid artery, IVT=intravenous thrombolysis, NIHSS=National Institutes of  
 398 Health Stroke Scale, MCA=middle cerebral artery, MI=myocardial infarction, MT=mechanical thrombectomy;  
 399 mRS=modified Rankin Score, TIA=transient ischemic attack, mTICI=modified Thrombolysis in Cerebral  
 400 Infarction scale. <sup>1</sup>Three missing values.

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408 **Table 2. Outcomes according to successful recanalization after mechanical thrombectomy.**

|                                | Successful Recanalization |                     | p-value  | Unadjusted                           | Adjusted <sup>2</sup>                |
|--------------------------------|---------------------------|---------------------|----------|--------------------------------------|--------------------------------------|
|                                | No<br>(mTICI<br>0-2a)     | Yes (mTICI<br>2b/3) |          | OR (95%CI)                           | OR (95%CI)                           |
| Excellent outcome              | 2 (10. 5)                 | 54 (71. 1)          | <0. 001  | 16. 96 (3. 99 to 72. 04)             | 37. 41 (5.17 to 270. 48)             |
| Favorable outcome <sup>1</sup> | 6 (31. 6)                 | 63 (82. 9)          | <0. 001  | 9. 77 (3. 16 to 30. 16)              | 9. 87 (2. 92 to 33. 30)              |
| 90-day mRs, median             | 3 (2 to 4)                | 1 (0 to 2)          | <0. 001  | 9. 96 (3. 66 to 27. 13) <sup>3</sup> | 12. 21 (4.17 to 35. 68) <sup>3</sup> |
| Procedural complications       | 5 (27. 8)                 | 8 (10. 5)           | 0. 12    | 0. 31 (0. 08 to 1. 06)               | 0. 33 (0. 08 to 1. 27)               |
| Any ICH                        | 9 (47. 4)                 | 29 (38. 2)          | 0. 47    | 0. 69 (0. 24 to 1. 89)               | 0. 90 (0. 29 to 2. 71)               |
| Parenchymal hematoma           | 1 (5. 3)                  | 7 (9. 2)            | Not done | Not done                             | Not done                             |
| Symptomatic ICH                | 2 (10. 5)                 | 1 (1. 3)            | Not done | Not done                             | Not done                             |
| 90-day mortality               | 1 (5. 3)                  | 4 (5. 3)            | Not done | Not done                             | Not done                             |

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410 Values expressed as number (%) or median (Interquartile range). ICH=intracerebral hemorrhage, mRS=modified  
411 Rankin Score, OR=odds ratio. <sup>1</sup>pre-specified as primary outcome measure. <sup>2</sup>adjusted for pre-specified confounding  
412 factors (age and pre-treatment volume) and and pre-treatment NIHSS. <sup>3</sup>common OR for 1-point improvement in  
413 mRS (after pooled together 5 and 6) calculated using ordinal logistic regression model.

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## Supplemental material

**Table 1s. Procedural complications according to successful recanalization after mechanical thrombectomy**

|  | Successful recanalization  |                           |
|--|----------------------------|---------------------------|
|  | Yes (mTICI 2b/3)<br>(n=76) | No (mTICI 0-2a)<br>(n=19) |
| Subarachnoidal hemorrhage                  | 0                          | 3                         |
| Carotido-cavernous fistula                 | 0                          | 1                         |
| Hematoma at puncture site                  | 4                          | 2                         |
| Occlusion at puncture site                 | 1*                         | 0                         |
| Embolization in other arterial territories | 1*                         | 1*                        |

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418 Values are expressed as number.

419 \*Complications of a mechanical thrombectomy performed for an MCA M2 occlusion.

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**Table 2s. Univariate analysis comparing outcomes in patients with NIHSS < 8 at first neurological examination and with early neurological deterioration before treatment to patients with NIHSS < 8 immediately before MT.**

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|                                | Patients with early neurological deterioration (N=33) | Patients with NIHSS<8 before MT (N=95) | P value |
|--------------------------------|---|--|---------|
| Successful recanalization      | 28 (84.8)   | 76 (80)                                | 0.539   |
| Excellent outcome              | 13 (39.4)   | 56 (58.9)                              | 0.052   |
| Favorable outcome <sup>1</sup> | 18 (54.5)   | 69 (72.6)                              | 0.055   |
| 90-day mRs, median             | 2 (1 to 5)  | 1 (1 to 5)                             | 0.077   |
| Procedural complications       | 1 (3.0)   | 12 (12.6))                             | n/a     |
| Any ICH                        | 11 (34.4)   | 38 (40)                                | 0.572   |
| Parenchymal hematoma           | 1 (3.1)   | 8 (8.4)                                | n/a     |
| Symptomatic ICH                | 1 (3.1)   | 3 (3.2)                                | n/a     |
| 90-day mortality               | 4 (12.1)  | 5 (5.3)                                | 0.068   |

438 Values expressed as number (%) or median (Interquartile range). ICH=intracerebral hemorrhage, mRS=modified Rankin  
439 Score.

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Acute ischaemic stroke related to large vessel occlusion of anterior circulation persistent on pre-treatment digital subtraction angiography  
(N = 922)

NIHSS at first neurological examination < 8  
(N = 106)

NIHSS at first neurological examination ≥ 8  
(N = 816)

N = 73

N = 33

N = 22

NIHSS < 8 immediately before thrombectomy  
(N = 95)

NIHSS ≥ 8 immediately before thrombectomy

Tici 0-2a  
(N=19)

**Primary analysis**

Tici 2b-3  
(N=76)





