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Outcomes of Pre-stroke Disabled Patients with Acute Ischaemic Stroke Post Endovascular Thrombectomy

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Abbreviations: EVT= endovascular thrombectomy, mRS= modified Rankin Scale, NIHSS= National Institutes of Health Stroke Scale, TICI=thrombolysis in cerebral infarction, sICH=symptomatic intracranial haemorrhage, END=early neurological deterioration,

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Abstract

Background

Moderate-to-severe pre-stroke disability (modified Rankin Scale(mRS 3-5) is an exclusion criterion for endovascular thrombectomy (EVT) in acute ischaemic stroke (AIS), yet outcomes for this group remain underexplored.

Methods

Patients who underwent EVT, dichotomised to mRS≤2 or mRS3–5, between October 2015 and March 2020, were included from a national stroke registry. Favourable functional outcome was defined as mRS0–2 for the mRS≤2 cohort or no worsening of the mRS for the mRS3-5 cohort at (i)hospital discharge and (ii)6 months. Other outcomes included in-hospital mortality, symptomatic intracranial haemorrhage (sICH), early neurological deterioration (END), and successful

recanalisation (modified TICI2b-3). The effect of successful recanalisation on functional outcome and predictors of favourable functional outcome were assessed in the pre-stroke mRS3-5 group.

Results

Among 4,353 patients included in the study, 203 (4.6%) had moderate-to-severe pre-stroke disability. No significant difference in favourable functional outcome at discharge (30.5% mRS3-5 vs 33.0% mRS0-2 pre-stroke, aOR:1.21, 95%CI:0.87–1.70, p=0.25) and at 6 months (p=0.97), sICH (p=0.39), END (p=0.72), or successful recanalisation (p=0.15) was demonstrated. In-hospital mortality was higher in the pre-stroke mRS3-5 group (p<0.009). Successful recanalisation was significantly associated with favourable functional outcomes compared to no recanalisation (p=0.008). Admission NIHSS, onset-to-arterial-puncture time, EVT technique and successful recanalisation independently predicted functional outcome amongst patients with pre-stroke mRS3-5.

Conclusion

Moderate-to-severe pre-stroke disability was comparable to pre-stroke mRS0-2 with respect to favourable functional outcomes post EVT, and may not be a justified exclusion criterion for EVT in AIS. Randomised studies are necessary to optimise decision-making and evaluate the broader impact of EVT in this population.

What is already known on this topic – There is paucity of available data and endovascular treatment outcome heterogeneity for patients with pre-existing moderate to severe functional disability (modified Rankin score 3-5) presenting with acute ischaemic stroke secondary to large vessel occlusion.

What this study adds – This large national stroke registry of 4353 patients demonstrates that, compared to patients with pre-stroke mRS 0-2, pre-stroke moderate to severely disabled patients (mRS 3-5) undergoing EVT for AIS achieve similar rates of favourable outcomes when selected in a real-world setting, despite higher rates of early mortality. Our findings indicate that a proportion of moderate to severe pre-stroke disabled patients, particularly those achieving successful recanalisation, may have preventable disability if not excluded from endovascular thrombectomy.

How this study might affect research, practice or policy – It is essential to ensure that decisions about EVT are more inclusive and not restricted by pre-stroke disability status, to prevent potential clinical treatment discrimination against pre-stroke disabled patients. Ethical, economic and clinical considerations must guide careful patient selection, balancing potential benefits against risks.

Introduction

Pre-stroke disability, commonly regarded as having a modified Rankin Score (mRS) greater than 1, has a reported prevalence of around 25% of acute ischaemic stroke (AIS) presentations and was an exclusion criterion for endovascular thrombectomy (EVT) in many stroke trials (1-3). To date, no dedicated randomised data are available to determine the efficacy and safety of EVT for patients with a moderate or severe pre-stroke disability (mRS 3-5) presenting with an AIS due to an anterior circulation large vessel occlusion (LVO). If left untreated, these patients risk facing accumulated disability requiring increased care and rehabilitation. Information gathered from international surveys suggest the decision to perform EVT is mostly made on a case-by-case basis in this group (4). Thus, there is a need for robust data to optimise outcomes for this group of patients and minimise potential discrimination.

Some observational studies have examined the efficacy of EVT in patients with pre-existing disabilities, comparing outcomes with those in patients without prior disability or those managed medically. Findings across these studies have been heterogeneous, demonstrating improved, equivalent, or, in some cases, worsened clinical outcomes (5). However, there have been variable definitions of pre-stroke disability in the inclusion criteria and outcome measures utilised across prior studies, precluding accurate comparative analyses (2, 6-12).

Overall, there remains paucity of available data and treatment outcome heterogeneity for patients with pre-existing functional disability presenting with AIS secondary to LVO. The aim of this study is to compare the characteristics, procedural and clinical outcomes of pre-stroke moderate to severely disabled patients (mRS 3-5) with that of patients with a pre-stroke mRS 0–2 presenting with AIS secondary to LVO of the anterior circulation who subsequently underwent EVT.

Methods

Ethics

The Sentinel Stroke National Audit Programme (SSNAP) national stroke registry is authorised to collect patient data without explicit consent under Section 251 (NHS Act 2006), as approved by the Confidentiality Advisory Group of the National Health Service Health Research Authority. The use of pseudonymised data was approved by the Healthcare Quality Improvement Partnership Data Access Request Group (Ref: HQIP366). Additional ethical approval was not required for this study. Data access requests should be directed to SSNAP as the data provider and HQIP as the data controller.

Study design

A retrospective cohort analysis was conducted using data from the SSNAP registry. SSNAP is a national stroke registry that encompasses every acute stroke-admitting hospital in England, Wales, and Northern Ireland, providing comprehensive data on stroke care for over 90% of the eligible population. Eligibility for treatment was determined via protocol at the health organisation level by practitioners. Patient information, prospectively recorded in the SSNAP database by clinical teams, was derived from data provided by the patients, their families, or medical records. Prospective data were recorded using a secure web-based case report form with real-time data validation checks to ensure data quality, from the time of admission up to 6 months after stroke.

Pseudonymised, individual-level data of adult patients (≥18 years) diagnosed with AIS and treated with EVT between 1 October 2015 and 31 March 2020 were included. Patients without an available mRS score at discharge were excluded from the study. No restrictions for characteristics were imposed on the clinical inclusion criteria for this study. Data on the baseline Alberta Stroke Program Early CT Score (ASPECTS) and thrombus location were not available in the registry. For the primary analysis, patients were grouped based on their pre-stroke functional status, with a (i) pre-treatment of mRS of 0-2, and (ii) pre-treatment mRS of 3-5, which was classified as moderate to severe pre-stroke disability.

Outcome measures

The primary outcome measure was the proportion of patients who achieved a favourable functional outcome at hospital discharge, defined as achieving the baseline mRS score at discharge for pre-stroke moderate to severely disabled patients (i.e. no added functional disability based on the mRS), and an mRS score of 0–2 for patients with a pre-stroke mRS of 0-2. Other outcome measures included: favourable functional outcome measured at 6 months post-EVT, early neurological deterioration (END: NIHSS score ≥4 between admission and at 24 hours post treatment), successful recanalisation (modified Thrombolysis in Cerebral Infarction (mTICI) 2b-3), symptomatic intracerebral haemorrhage (sICH), defined as any intracerebral haemorrhage leading to a NIHSS score of ≥4 within 24 hours or death, and in-hospital mortality including all-cause mortality up till hospital discharge. The functional outcome was assessed by a member of the Stroke team/physician at discharge and during a routinely scheduled clinical visit at 6 months, or by a specialist nurse during a follow-up telephone interview if the patient was unable to attend.

Statistical Plan

For the pre-stroke mRS 0-2 and mRS 3-5 groups used in the primary analysis, the study characteristics were summarised using descriptive statistics for patient demographics, clinical characteristics, and time metrics. Continuous variables were presented as means with standard deviations (SD) or medians with inter-quartiles range (IQR), while categorical variables were reported as frequencies or percentages. Baseline variables were compared using the χ^2 test or Student's t-test, as appropriate. Univariate and multivariable analysis were carried out. Binary regression analysis was used for the dichotomised clinical outcomes. Multivariable regression analysis was conducted, adjusted for the baseline characteristics which differed (difference defined as $p < 0.10$) between groups for both the primary and subgroup analyses. Sub-group analyses were carried out for the following: (1) including only pre-stroke moderate to severely disabled patients

(mRS 3-5) grouped according to reperfusion status: (i) 0-2a (unsuccessful recanalisation) or (ii) mTICI 2b-3 (successful recanalisation) post-EVT, and (2) comparing patients with a moderate pre-stroke disability (mRS 3) to those with a pre-stroke mRS of 4-5. A sensitivity analysis comparing patients with a pre-stroke mRS 0-2 and mRS 3 only (excluding those with a pre-stroke mRS 4 and 5) was also performed. The aforementioned baseline characteristics and clinical outcomes as performed for the primary analysis for the subgroup of patients were tabulated. Additionally, to assess the independent predictors of favourable functional outcome at discharge, stepwise backward regression analysis was performed, which included characteristics which differed ($p<0.10$) between favourable and unfavourable functional outcomes of those with pre-stroke dependence. A two-tailed P-value of <0.05 was considered statistically significant. Statistical analyses were performed using StataNow version 18.5.

Results

The SSNAP registry held 4383 records of patients with AIS who underwent EVT at 25 EVT-capable neuroscience centres during the study period. 30 were excluded due to a lack of data on the mRS at discharge. Hence, a total of 4,353 patients were included in the overall analysis, consisting of 4,150 patients with pre-stroke mRS 0–2, of which 3099 were mRS 0, 716 were mRS 1, 335 were mRS 2, and 203 (4.6%) pre-stroke moderate to severely disabled patients (mRS 3–5), of which 156 were mRS 3, 40 were mRS 4 and 7 were mRS 5 (Figure 1).

Characteristics of Study Population

The median pre-stroke mRS was 0 (IQR 0–1) in the mRS 0-2 group and 3 (IQR 3–3) in the mRS 3-5 group. Most of the pre-stroke mRS 0-2 patients were aged under 80 years (77.6%), while nearly half of the pre-stroke mRS 3-5 group were aged 80 years or older (48.8%, $p<0.001$). Compared to the pre-stroke mRS 0-2 group, pre-stroke mRS 3-5 patients had higher rates of co-morbidities including hypertension (59.6% vs 47.1%, $p<0.001$), diabetes (28.1% vs 13.2%, $p<0.001$), congestive heart failure (28.1% vs 4.7%, $p<0.001$), and atrial fibrillation (34.5% vs 21.1%, $p<0.001$), and were less likely to undergo EVT with general anaesthesia (35.0% vs 53.0%, $p<0.001$) or receive intravenous thrombolysis (42.4% vs 59.8%, $p<0.001$). Procedural times were similar between the groups, The onset-to-groin puncture time (369.7 ± 361.6 minutes vs 369.3 ± 333.3 minutes, $p=0.98$) and procedural duration (58.0 ± 34.8 minutes vs 58.2 ± 37.8 minutes, $p=0.94$) were not significantly different between the groups (Table 1).

Outcomes

No significant differences were observed in favourable outcomes at discharge (30.5% of pre-stroke mRS 3-5 vs 33.0% pre-stroke mRS 0-2 patients, adjusted odds ratio (aOR) 1.21, 95% CI 0.87–1.70, $p=0.25$) or at six months (53.1% of pre-stroke mRS 3-5 vs 60.0% pre-stroke mRS 0-2 patients, aOR 1.01, 95% CI 0.53–1.91, $p=0.97$). Between the pre-stroke mRS 3-5 and pre-stroke mRS 0-2 groups respectively, there were also no significant differences demonstrated in END (13.5% vs 10.8%, $p=0.72$), successful recanalisation (77.3% vs 82.0%, $p=0.15$), or sICH (2.5% vs 3.7%, $p=0.39$), although in-hospital mortality was greater in the pre-stroke mRS 3-5 group (24.1% vs 11.8%, aOR 1.80, 95% CI 1.26-2.56, $p=0.001$) (Table 2).

Subgroup Characteristics and Outcomes

Among 203 pre-stroke mRS 3-5 patients, those with successful recanalisation (mTICI 2b-3) were more often under 60 years old (17.1% vs 3.9%) and less often aged 80–89 years (32.2% vs 58.8%; p = 0.003), more likely to undergo EVT with general anaesthesia (40.1% vs 19.6%; p=0.007), and undergo the combined aspiration with stent retriever technique (59.2% vs 43.1%; p=0.046) compared to those without recanalisation. No significant differences were noted in the comorbidities, stroke severity (p=0.79) and IV thrombolysis use (p=0.07). Procedural time metrics were also similar across both groups. (Supplementary Table 1).

There were higher odds of favourable functional outcome in the successful recanalisation group at discharge (aOR: 3.51; 95% CI: 1.39–8.83; p=0.008) compared to those without vessel recanalisation, whilst END was less frequent (aOR: 0.15; 95% CI: 0.05–0.44; p=0.001) in the successful recanalisation group. No significant differences were observed in rates of sICH (aOR: 0.35; 95% CI: 0.02–6.70; p=0.48) or in-hospital mortality (aOR: 0.66; 95% CI: 0.31–1.40; p=0.28) (Table 3).

Among the pre-stroke mRS 3-5 patients, 156 were mRS 3 and 47 were mRS 4-5. There were higher odds of favourable functional outcome in the pre-stroke mRS 4-5 group compared to the pre-stroke mRS 3 group at discharge (24.4% pre-stroke mRS 3 vs 51.1% pre-stroke mRS 4-5 patients, aOR 5.05, 95% CI 1.81–14.05, p=0.002) (Supplemental Tables 2 and 3).

In the sensitivity analysis comparing patients with a pre-stroke mRS 0-2 and mRS 3 only (excluding pre-stroke mRS 4-5), no significant difference in the favourable functional outcome was identified (aOR 0.91, 95% CI 0.60–1.37, p=0.64) (Supplemental Tables 4 and 5).

Independent predictors of favourable functional outcome for pre-stroke dependent patients

Lower admission NIHSS score (aOR: 0.91; 95% CI: 0.87–0.96; p<0.001), successful vessel recanalisation (aOR: 4.90; 95% CI: 1.94–12.35; p=0.001), shorter onset-to-arterial puncture time (per-minute) (aOR: 0.99; 95% CI: 0.99–0.99; p=0.012), and aspiration technique only (aOR: 0.43; 95% CI: 0.22–0.85; p=0.01) were independent predictors of favourable functional outcome at discharge (Supplementary Tables 6 and 7).

Discussion

This large national stroke registry offers valuable real-world insights into the characteristics and clinical outcomes for patients presenting with a pre-stroke moderate to severe disability treated with EVT. The findings indicate that pre-stroke mRS 3-5 patients do not experience worsened accumulated disability at hospital discharge, or at six months, compared to pre-stroke mRS 0-2 patients. The safety outcomes of sICH and END were also comparable between both groups, however in-hospital mortality was higher in the pre-stroke mRS 3-5 group. Compared to no recanalisation, pre-stroke mRS 3-5 patients achieving successful recanalisation had significantly higher odds of favourable functional outcome at discharge. Admission NIHSS, onset-to-arterial-puncture time, EVT technique and successful recanalisation independently predicted functional outcome amongst patients with pre-stroke moderate to severe disability.

In common with prior studies, patients with a pre-stroke mRS 3-5 were more likely to be older (>80 years) and have multiple co-morbidities, and less likely to receive intravenous thrombolysis, compared to those with a pre-stroke mRS 0-2. Our results show similar rates of favourable outcome (approximately 30%) compared to most previous studies (2, 8, 10, 13, 14). Our study also found a higher likelihood of favourable functional outcomes when successful recanalisation was achieved, with an odds ratio of 3.56 (p=0.008), similar to previous studies (10). These findings underscore the importance of vessel recanalisation in this cohort. There were increased odds of favourable functional outcome at discharge in the pre-stroke mRS 4-5 group compared to the mRS 3 group. A possible reason for this paradoxical finding may be due to the crude measure of the mRS, which does not distinguish smaller changes in functional disability in individuals with an already severe pre-existing disability (mRS 4-5 group) compared to those with mild to moderate disability. Combined aspiration and stent retriever technique was intriguingly associated lower odds of favourable functional outcomes in the pre-stroke mRS 3-5 cohort. It is possible that the combined technique was required for more resistant thrombus retrieval, and hence requiring more thrombectomy passes, compared to the aspiration technique only. Furthermore, compared to contact aspiration only, the use of stentretrievers may induce vessel intimal injury which may be detrimental in the tissue recovery cascade. However, this remains hypothesis-generating and warrants confirmation in future studies. Further research determining other predictors of functional outcome in pre-stroke mRS 3-5 cohort not captured in our study, such as brain frailty, should be considered (16).

It is essential to ensure that decisions about EVT are more inclusive and not restricted by pre-stroke disability status, to prevent potential clinical treatment discrimination against pre-stroke disabled patients. Ethical considerations extend beyond the provision of reasonable care. The evaluation of whether EVT is justifiable in this population needs to be based on a balanced assessment of risks and benefits. A key consideration is the potential for increased mortality risk or worsening of functional outcomes necessitating nursing home care observed in pre-stroke disabled groups reported in previous studies (15, 16). There were higher rates of in-hospital mortality rate in the pre-stroke mRS 3-5 group, possibly due to the increased frailty as indicated by the higher rates of the co-morbidities in this cohort compared to the pre-stroke mRS 0-2 group. However, the favourable functional outcomes were encouragingly similar between groups in our study. Overall, treatment decisions

should also be considered within the broader framework of health resource allocation or cost effectiveness, and the societal impact of healthcare interventions.

Strengths of this study include the large sample size of pre-stroke moderate to severely disabled patients (n=203) treated with EVT, the national coverage of a numerous EVT centres, and the high case ascertainment with consecutive patient enrolment. This study has several limitations. First, as an observational study, our findings are inherently subject to confounding by potential bias in selecting patients for EVT. It is possible that patients with moderate to severe pre-stroke disability with an LVO selected for EVT were less frail or were perceived to have a higher recovery potential than those treated without EVT. Paucity of data on the ASPECTS and thrombus location also limits the interpretation of findings due to potential underlying selection biases. However, the high baseline stroke severity NIHSS across both groups may reflect the inclusion of patients with similar infarct sizes in both cohorts. Second, while the subgroup analysis aimed to model a control group not receiving EVT (i.e. those who did not achieve vessel recanalisation), this approach does not fully account for the complexity of comparing EVT to no EVT. Third, there were some missing data for certain outcome measures, including the mRS at 6 months. However, our primary outcome measured the mRS at hospital discharge (99.3% data availability) and has been shown to correlate highly with functional outcomes at 3 months (17). Fourth, longer term clinical outcome data beyond 6 months, which would have been useful in this cohort of patients, is not available in the registry. Fifth, the post-procedural mTICI and mRS scores were assessed locally by treating clinicians and were not centrally adjudicated. Sixth, although the mRS is a widely accepted outcome metric in stroke studies, it remains a crude measure of the level of disability, not accounting for the differences in quality of life, which was not captured in this registry. Last, the paucity of data granularity precludes further analysis in distinguishing all-cause mortality vs stroke-related mortality in this cohort.

Conclusion

This study demonstrates that, compared to patients with pre-stroke mRS 0-2, pre-stroke moderate to severely disabled patients (mRS 3-5) undergoing EVT for AIS achieve similar rates of favourable outcomes when selected in a real-world setting, despite higher rates of early mortality, challenging the notion of excluding pre-stroke disabled patients from EVT. Our findings indicate that a proportion of pre-stroke moderate to severely disabled patients, particularly those achieving successful recanalisation, may have preventable disability if not excluded from treatment. However, ethical, economic and clinical considerations must guide careful patient selection, balancing potential benefits against risks, as well the cost effectiveness of treatment in public healthcare systems. Randomised studies are necessary to optimise decision-making and evaluate the broader impact of EVT in this population.

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Tables and Figures

Figure 1. Flow chart of the patient inclusion, exclusion, and outcome data for endovascular thrombectomy (EVT) treatment for the primary group analysis and subgroup analysis.
mRS = modified Rankin scale, n = Number of patients.

Table 1. Table of characteristics for patients who underwent endovascular thrombectomy (EVT) grouped based on pre-stroke disability according to the modified Rankin scale (mRS).

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		n (%) median (IQR) or mean±SD Pre-stroke mRS 0-2	n (%) median (IQR) or mean±SD Pre-stroke mRS 3-5	P value
Sample Size (n)		4150	203	
Median baseline mRS		0 (0-1)	3 (3-3)	
Social Demographics				
	<60 years	1125 (27.1)	28 (13.8)	
	60-69 years	846 (20.4)	24 (11.8)	
	70 - 79 years	1235 (29.8)	52 (25.6)	
	80-89 years	844 (20.3)	79 (38.9)	
	>90 years	100 (2.4)	20 (9.9)	<0.001
	Males	1862 (44.9)	121 (59.6)	<0.001
Co Morbidities				
	Hypertension	1955 (47.1)	121 (59.6)	<0.001
	Diabetes	547 (13.2)	57 (28.1)	<0.001
	Congestive heart failure	196 (4.7)	57 (28.1)	<0.001
	Atrial Fibrillation	876 (21.1)	70 (34.5)	<0.001
Baseline Characteristics				
	General Anaesthesia	2194 (53.0)	71 (35.0)	<0.001
	Stroke severity Arrival (NIHSS)	16.58 (±6.92)	17.55 (±7.38)	0.052
	IV thrombolysis	2481 (59.8)	86 (42.4)	<0.001
	Aspiration + Stent retriever	1793 (43.2)	112 (55.2)	0.001
Procedural Time Characteristics				
	Onset to Groin puncture	369.3 (±333.3)	369.7 (±361.6)	0.98
	Procedure duration	58.2 (±37.8)	58.0 (±34.8)	0.94
	Groin Puncture to first EVT pass	25.6 (±19.2)	27.5 (±19.9)	0.20
n = Number of patients, mRS = modified Rankin scale, NIHSS = National Institutes of Health Stroke Scale, IV = Intravenous, sICH = symptomatic intracranial haemorrhage, Groups were compared using Chi-squared and Mann-Whitney U-tests as appropriate.				

Table 2. Outcomes for pre-stroke mRS 0-2 and mRS 3-5 patients post endovascular thrombectomy.

Table 2. Outcomes for pre-stroke mRS 0-2 and mRS 3-5 patients post endovascular thrombectomy.

mRS = modified rankin scale, END = Early neurological deterioration, NIHSS = National Institutes of Health Stroke Scale, IV = Intravenous, sICH = Symptomatic intracranial haemorrhage, mTICI = modified Thrombolysis in Cerebral Infarction, OR = odds ratio. *Adjusted odds ratio for Age, Sex, Hypertension, Diabetes, Atrial fibrillation, Congestive heart failure, General anaesthesia, Stroke severity Arrival (NIHSS), IV thrombolysis and Aspiration + Stent retriever thrombectomy technique

	Pre-stroke mRS 0-2 n/N (%)	**Pre-stroke mRS 3-5 n/N (%)**	**Unadjusted OR (95% CI)**	**P value**	**Adjusted OR* (95% CI)**	**P value**
Favourable functional outcome (Discharge)	1371/4150 (33.0)	62/203 (30.5)	0.89 (0.66-1.21)	0.46	1.21 (0.87-1.70)	0.25
Favourable functional outcome (6 months)	745/1243 (60.0)	25/47 (53.1)	0.76 (0.42-1.36)	0.35	1.01 (0.53-1.91)	0.97
END	429/3963 (10.8)	26/193 (13.5)	1.24 (0.80-1.91)	0.33	1.09 (0.68-1.73)	0.72
mTICI 2b-3	3401/4150 (82.0)	157/203 (77.3)	0.68 (0.49-0.94)	0.02	0.78 (0.56-1.10)	0.15
sICH	99/2697 (3.7)	3/121(2.5)	0.67 (0.21-2.1)	0.49	0.58 (0.17-1.99)	0.39

In-hospital mortality	491/4150 (11.8)	49/203 (24.1)	2.37 (1.70-3.31)	<0.001	1.80 (1.26-2.56)	**0.001**

Table 3. Outcomes for pre stroke disabled patients (mRS 3-5) grouped by post-treatment recanalisation status

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	mTICI <2b n/N (%)	mTICI 2b-3 n/N (%)	Unadjusted OR (95% CI)	P value	Adjusted OR* (95% CI)	P value
Favourable functional outcome (Discharge)	7/51 (13.7)	55/152 (36.2)	3.56 (1.50-8.45)	0.004	3.51 (1.39-8.83)	0.008
Favourable functional outcome (6 months)	3/12 (25.0)	22/35 (62.9)	5.07 (1.16- 22.20)	0.031	2.88 (0.45-18.50)	0.26
END	12/46 (26.1)	13/147 (9.0)	0.27 (0.12-0.66)	0.004	0.15 (0.05-0.44)	0.001
sICH	1/25 (4.0)	2/96 (2.1)	0.51 (0.04-5.87)	0.59	0 .35 (0.02-6.70)	0.48
In-hospital mortality	15/52 (28.8)	34/152(22.4)	0.69 (0.34- 1.41)	0.31	0.66 (0.31-1.40)	0.28

mRS = modified rankin scale, mTICI = modified Thrombolysis in Cerebral Infarction, END = Early neurological deterioration, NIHSS = National Institutes of Health Stroke Scale, IV = Intravenous, sICH = Symptomatic intracranial haemorrhage, OR = odds ratio. *Adjusted odds ratio for Age, General anaesthesia, IV thrombolysis and Aspiration + Stent retriever technique