The SITS Open study: a prospective, open label blinded evaluation study of thrombectomy in clinical practice

Authors

Niaz Ahmed, PhD[1,2] Kennedy R Lees, MD[3] Rüdiger von Kummer, MD[4], Staffan Holmin, PhD[2,5], Irene Escudero-Martinez, MD[6,7], Matteo Bottai, ScD[8], Olav Jansen, PhD[9], Nils Wahlgren, PhD[2]

Affiliations

[1] Department of Neurology, Karolinska University Hospital, Stockholm, Sweden

[2] Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden

[3] School of Medicine, Dentistry & Nursing, University of Glasgow, Glasgow G12 8QQ, UK

[4] Department of Diagnostic and Interventional Neuroradiology, University of Dresden, Germany

[5] Department of Neuroradiology, Karolinska University Hospital, Stockholm, Sweden

[6] Department of Neurology, University Hospital Virgen del Rocío, Sevilla, Spain

[7] Neurovascular Research Laboratory, Instituto de Biomedicina de Sevilla-IBiS, Spain

[8] Institute of Environmental Medicine, Biostatistics, Karolinska Institutet, Stockholm, Sweden

[9] Department of Radiology and Neuroradiology, University Hospital Schleswig-Holstein, Campus Kiel, Germany

Corresponding author

Niaz Ahmed, MD, PhD

Associate Professor, Karolinska Institutet

Department of Neurology

Stroke Research Unit, R2:03

Karolinska University Hospital-SolnaSE-171 76, Stockholm, Sweden

Tel: +468 517 720 26

E-mail: niaz.ahmed@sll.se

alt. e-mail: niaz.ahmed@ki.se

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ABSTRACT

Background and purpose: We designed SITS Open to determine benefit and safety of thrombectomy in clinical practice for large artery occlusion stroke, using selected stent retrievers plus standard care versus standard care alone.

Methods: SITS Open was a prospective, open, blinded evaluation, international, multicentre, controlled, non-randomised registry study. Centres lacking access to thrombectomy contributed controls. Primary endpoint was categorical shift in modified Rankin Scale (mRS) score at 3-months in the per protocol (PP) population. Principal secondary outcomes were symptomatic intracranial haemorrhage (SICH), functional independency (mRS 0-2) and death at 3-months. Patients independently evaluated by video-recorded mRS interviews blinded to treatment or centre identity by central core lab were regarded as PP population. Propensity score matching (PSM) with covariate adjusted analysis was performed.

Results: During 2014-2017, 293 patients (257 thrombectomy, 36 control) from 26 centres in 10 countries fulfilled intention to treat and 200 (170 thrombectomy, 30 control) PP criteria; enrolment of controls was limited by rapid uptake of thrombectomy. In PP analysis, median age was 71 vs. 71 years, and baseline NIHSS 17 vs. 17 in the thrombectomy and control arms respectively. The PSM analysis for PP showed a significant shift for mRS at 3 months favouring the thrombectomy group (OR 3.8, 95% CI 1.61-8.95, p=0.002). Regarding safety, there were 4 cases of SICH in the thrombectomy group (2.4%) and none in the control group.

Conclusions: In clinical practice, thrombectomy for patients with large artery occlusion stroke is superior to standard of care in our study.

Clinical Trial Registration Information:

https://clinicaltrials.gov/ct2/show/NCT02326428, Identifier: NCT02326428

Non-standard Abbreviations and Acronyms

FA: full analysis

ITT: Intention-to-treat

LAO: Large artery occlusion

PP: Per protocol

PSM: Propensity score matching

RCTs: Randomized controlled trials

SITS-ISTR: Safe Implementation of Treatment in Stroke-International Stroke Treatment Registry

INTRODUCTION

Five randomized controlled trials (RCTs) in 2015 and a subsequent meta-analysis[1-6] have demonstrated the benefit of thrombectomy with second-generation devices (mainly stent retrievers) over medical therapy alone among patients with anterior circulation stroke due to large artery occlusions (LAO). In 2018, two trials have demonstrated the efficacy of EVT up to 24 hours in selected patients[7,8] and latest guidelines recommend thrombectomy up to 24 hours in carefully selected patients. [9,10]

The SITS Open study protocol was developed in 2013 just after publication of 3 RCTs that had each failed to show the efficacy of endovascular ischemic stroke treatment.[11,12,13] At that time, many experienced thrombectomy stroke centres found it ethically difficult to randomise patients with a perceived likelihood of beneficial outcome from thrombectomy compared to medical therapy; other centres lacked any access to thrombectomy, not even transferring selected patients to a thrombectomy centre. Therefore, we designed a non-randomised study with robust measures to protect against potential confounding from bias.

Our hypothesis in 2013 was that, in clinical practice, patients with large artery occlusive stroke treated with thrombectomy and best medical treatment would show better functional outcomes than patients with best medical treatment only (including thrombolysis when indicated).

Subsequently, the study protocol was amended to compare the SITS Open results against the thrombectomy arm of the pooled analysis of the 5 RCTs as a secondary aim.

METHODS

Study Design

SITS OPEN was a prospective, controlled study in which treatment allocation was openly assigned within non-randomised clusters, but in which robust measures were incorporated to protect against potential confounding and bias. These measures included concurrent enrolment of controls; central core-lab evaluation of baseline and follow-up neuroimaging; propensity score selection and matching of the analysis populations based on baseline data without access to outcomes; and video-recorded modified Rankin Scale (mRS) assessment with independent central adjudication of outcomes, blinded to treatment or centre identity. The thrombectomy and control sites (supplemental table I) were highly qualified medical centres with comparable experience in acute stroke care and results in terms of stroke outcomes. Thrombectomy sites should have experience in endovascular treatment; control sites declared no access to thrombectomy: any control site that would introduce referral for thrombectomy would be withdrawn from further enrolment. Centre comparability assessment was based on compliance with standard stroke care including IVT use according to guidelines, monthly admission numbers, distribution of stroke severity, and non-inferiority of outcomes.

Patient inclusion and exclusion criteria

Main inclusion criteria were CT or MRI verified ischemic stroke and CTA-or MRA-evidence of major cerebral artery (distal ICA, proximal MCA, ACA and PCA and basilar artery) occlusion; fulfilment of accepted criteria for IVT and IVT initiated within 4.5 hours when applicable; and NIHSS before IVT $\geq$ 7 or higher (maximum 25 for

anterior circulation stroke and no upper limit for posterior circulation strokes). See appendix 1 for the complete list of criteria.

Data collection

We developed a dedicated eCRF within the SITS International Stroke Treatment Registry (ISTR), organised at Karolinska Institutet, Stockholm, Sweden, to collect data for the SITS Open. The eCRF was integrated into the SITS framework with secure internet connection and with high security password protection. The investigators were responsible to verify data entry accuracy: no monitoring was conducted. In parallel, all relevant information was recorded in hospital patient files in accordance with local regulations.

Variables

Baseline and demographic characteristics including cerebrovascular risk factors, medication at stroke onset, stroke severity using the NIHSS score and pre-stroke disability using the mRS, ischemic lesion on brain imaging prior to treatment, site of occlusion, recanalization status according to Arterial Occlusive Lesion (AOL) score [14] and modified TICI score [15], blood pressure, NIHSS at 12, 24 hours and 7 days following treatment, follow up brain imaging scans at 22-36 hours after treatment and any other extra imaging scans to assess for hemorrhagic transformation (see appendix 2 for definitions), modified Rankin Scale (mRS) at 3 months were collected from the study sites. Baseline and follow-up imaging were independently evaluated by a central imaging laboratory (see below).

Imaging

Baseline brain imaging with non-enhanced CT (NCT) or MRI, baseline CTA or MRA, digital subtraction angiography (DSA) for thrombectomy, and follow-up NCT/MRI were collected from the study sites, checked for quality and anonymized at Brain Research Imaging Centre in Edinburgh, and consecutively sent to the neuroimaging core laboratory in Dresden, Germany. Follow-up images were not sent before baseline imaging was evaluated and archived. The thrombectomy DSA-images were not sent before follow-up imaging was evaluated and archived in order to keep the blind of the neuroimaging core laboratory for treatment and follow-up pathology. An experienced neuroradiologist (RvK) evaluated images at the core laboratory following the rules of a pre-specified imaging manual (Appendix 3). Infarct volumetry was not performed and the Alberta Stroke Program Early CT score (ASPECTS) was used to semi-quantify ischemic oedema at baseline and follow-up.

Treatment

All patients received intravenous thrombolysis with alteplase (dose 0.9 mg/kg) at the first hospital of arrival, according to guidelines. Endovascular treatment consisted of thrombectomy with a stent retriever and/or thrombus aspiration. Endovascular procedures were performed under general anaesthesia or conscious sedation according to local protocols. Initiation of thrombectomy was recommended within 6 hours of stroke onset but could be performed within 8 hours if it would still be of benefit as judged by the investigator.

Follow-up

The local investigator or sub-investigators performed a structured interview for

determining the mRS score at day 90 and documented this in the eCRF. The interview was recorded on video for additional independent blinded evaluation and uploaded to the secure Central Adjudication of Rankin Scores (CARS) website at the University of Glasgow via a link in the eCRF. After any necessary translation of the audio component by a bilingual clinician, and confirmation of anonymisation and centre/treatment concealment, the video recording was distributed to four members of a team of expert clinical adjudicators in Glasgow, scoring independently of each other, according to well established, validated methods. [16, 17, 18, 19, 20] This blindly adjudicated score was used for the primary analysis.

Endpoints

Our primary endpoint was the categorical shift across all 7 levels of the mRS score at day 90 in the per protocol population. Secondary endpoints included the proportion of patients with functional independence (mRS, score 0-2), and excellent recovery (mRS score 0-1) at 3 months after stroke, recanalization rates, neurological improvement at various time points, duration of in-hospital stay, recurrent stroke within 3 months, and proportion of patients with recanalization before thrombectomy.

Key safety variables were proportions of patients with symptomatic intracranial hemorrhage (SICH) according to the modified SITS-MOST definition (SICH/mSITS-MOST) defined as parenchymal hemorrhage type 2 or subarachnoidal hemorrhage on 22-36h imaging scans causing worsening of >=4p on NIHSS within 24h or death (modified SITS-MOST definition; SICH/mSITS-MOST),[21] parenchymal haemorrhage type 2, all-cause mortality at three months, neurological death within 7 days post treatment, distal embolism and reocclusion, and any adverse event related to thrombectomy.

Statistical analysis

Our sample size calculation was based on previously observed rates for known clinical outcomes for intravenous thrombolysis treated and thrombectomy treated patients and data from SITS-ISTR database. A sample of 600 patients treated with thrombectomy versus 300 control patients was anticipated to deliver 94% power to detect a 17% difference in binary outcome (mRS 0-2) with alpha two-sided level 0.01; power for the primary ordinal analysis would be expected to exceed this.

Our analysis populations were specified as: intention-to-treat population (ITT; all patients who were included in the study with the intention to be treated and gave informed consent for use of their data), full analysis population (FA, all subjects who met the inclusion criteria, were enrolled into a thrombectomy or control centre with 3 months follow up mRS either recorded or documented in clinical records, if not preceded by death) and per protocol population (PP, all patients who met criteria for full analysis, with video recorded 3 months mRS, unless preceded by death). Because this was a parallel, non-randomised registry study, the primary analysis was to be undertaken of blindly adjudicated outcomes among the successfully matched patients of the per protocol population, with other populations analysed for sensitivity.

Baseline measurements, risk factors, concomitant therapy, and time intervals are presented by descriptive statistics between groups. For categorical data, the number with the condition, the number evaluated, the percentage, and the exact 95% confidence intervals on the percentage is provided. For continuous variables, the summary statistics are reported. Variables that were considered from prior knowledge or exploratory analysis to be likely to associate with either treatment assignment or the primary outcome were entered to the model to estimate propensity scores.

Thrombectomy patients were matched to controls based on their propensity scores, considering 1:1, 2:1, 3:1 matching without replacement, and without access to outcome data, aiming to maximise the analysis sample while maintaining optimal balance in baseline variables. Decisions concerning inclusion within the PP population and finalisation of matching were taken by the study steering committee without access to the related outcome data.

The categorical shift in mRS score in thrombectomy vs. control group was assessed by proportional odds logistic regression. The primary analysis was adjusted for each factor that was predicted in advance to act as an important prognostic variable (age, sex, baseline NIHSS, systolic blood pressure and onset to treatment time, OTT) and for any factor that contributed significantly to the propensity score; propensity scores themselves were not used for covariate adjustment.

Binary efficacy variables were analysed using multiple logistic regression with treatment group and adjustments for the prognostically important covariates. Continuous endpoints (onset-to-treatment time and length of in-hospital stay) were analysed with linear regression and quantile regression with treatment group when the model assumptions were met. Treatment groups were tested at the 2-sided 5% significance level.

Enrolment of controls and of control centres was limited by rapid uptake of thrombectomy after 2015. A modification of the study protocol was implemented in 2016 to incorporate comparison of the PP thrombectomy population outcomes against those of thrombectomy patients in the HERMES meta-analysis. For this analysis, adjustment for baseline covariates was not possible. [6] Missing data were excluded from the analysis.

We also performed post-hoc analysis by excluding basilar artery occlusion as the

number of recruited patients with basilar artery occlusion was low in the study and the prognosis is usually differ than anterior circulation stroke.

Ethics

The study protocol was registered at ClinicalTrials.gov (NCT02326428). The study protocol was approved by the ethics committees (EC) of the coordinating centre and of each centre contributing patients' data. Treatment assignment was not affected by study participation and so patients consented only to data collection including mRS recording. This informed consent was documented as soon as practically possible after admission, and always within the acute hospital stay.

RESULTS

Figure 1 shows the study flow chart. Between March 2014 and September 2017, 293 patients (257 thrombectomy, 36 control) from 26 centres across 10 countries fulfilled intention to treat (ITT) criteria, 247 patients (215 thrombectomy, 32 control) full analysis criteria and 200 (170 thrombectomy, 30 control) per protocol (PP) criteria. Although the target sample had been for 600 thrombectomy and 300 control patients, enrolment was prematurely stopped because inclusion of controls was severely limited by rapid uptake of thrombectomy after the publication of the clinical trials in early 2015.

Supplemental table I shows the list of 25 participating centres in the full analysis population and the number of patients included per each centre. Supplemental tables II (for the full analysis population) and III (for the per protocol population) show the baseline and demographic characteristics of patients included in the SITS Open study. All patients received IVT in the thrombectomy arm. In the full analysis population,

there were no statistically significant baseline differences between patients in thrombectomy and control arms, except for mean time from stroke onset to IVT, that was longer in the control group (121 vs 170, p<0.001). Regarding radiological findings and endovascular procedures, median ASPECTS was 8 (8-10) for the thrombectomy arm. The most used device was Solitaire. In 17/155 patients (11%), thrombectomy was not performed due to successful reperfusion by IVT. A summary of radiological findings and procedures are presented in supplemental tables IV and V.

Efficacy endpoints in per protocol population

Primary and secondary endpoints are presented in table 1 to 3. Baseline matching of treatment groups was optimal with 2:1 thrombectomy: controls, achieving comparable distributions of propensity scores with retention of 54/143 (37.8%) thrombectomy patients and 27/27 (100%) controls (supplemental material). Before matching, the underlying covariates were well balanced except that mean onset to IVT was shorter in the thrombectomy group (124 versus 172 minutes, p<0.001) and the percentage of proximal stenosis (22.4% vs 52%, p<0.001). After matching, 14 (52%) patients in the control and 16 (30%) in the thrombectomy group had proximal stenosis.

The matched cohort analysis of mRS ordinal distributions (Supplemental table VI) showed a significant shift favouring the thrombectomy group: OR 3.8, 95% CI 1.61-8.95. Figure 2a shows the corresponding raw 90-day mRS distributions after matching and figure 2b before matching in the per protocol population. Results after excluding basilar artery occlusion were similar (the matched cohort analysis of mRS ordinal distributions showed a significant shift favouring the thrombectomy group: OR 3.79, 95% CI 1.49-9.66) to the results according to the study protocol (supplemental table VII and VIII).

For the secondary endpoints, patients in the thrombectomy group had significantly higher rates of good and excellent outcomes at 90 days and recanalization (AOL 2-3) at 24 hours. Patients in the thrombectomy group also presented higher rates of neurological improvement, better radiological outcome and shorter in-hospital stays. Secondary endpoints of the full population showed similar results (table 2), Sensitivity analysis for the mRS distribution in the unmatched ITT population confirmed a significant shift favouring the thrombectomy group versus controls (OR 4.52, 95% CI 2.28-8.96, p<0.001).

Safety endpoints

In the full analysis population, we found no difference in PH type 2 or any PH between thrombectomy and control groups. Regarding SICH/mSITS-MOST, there were 4 cases in the thrombectomy group and none in the control group. Patients in the thrombectomy group presented a lower mortality rate at day 90 compared to the control group. No differences were shown in neurological death at day 7, distal embolism or reocclusion (table 2). Regarding safety, similar results were also observed in the per protocol population and after matching (supplemental table IX).

Comparison to HERMES

Table 3 shows the comparison of the results of the SITS Open thrombectomy patients (per protocol population) to the thrombectomy arm of the HERMES meta-analysis. The unadjusted rates of functional independence and excellent outcome were comparable, as were the OR for these endpoints and for the shift in mRS at 90 days. Time from stroke onset to revascularization was shorter in patients in SITS Open study (median time 248

vs 285 in HERMES). Regarding safety outcomes, the rates of SICH/mSITS-MOST, parenchymal hemorrhage type 2 and death at 90 days were also comparable.

DISCUSSION

Our study of clinical practice data with blinded evaluation has demonstrated that thrombectomy was significantly associated with a favourable shift in mRS compared to control. Safety and other secondary outcomes after thrombectomy in our study are also comparable to those of thrombectomy delivered within clinical trial settings.[1-6]

Several studies providing real-world results of thrombectomy have been published lately.[22, 23] When comparing SITS Open cohort with other registries, the rate of centrally adjudicated functional independence was higher in SITS Open and the mortality and adjudicated intracranial hemorrhage rates were lower than the reported rates in other clinical practice settings. Some caution should be applied to interpretation of the mortality difference in the per protocol population, however. Entry to that population was determined by availability of a 3-month mRS score or known death by 3 months. Incomplete mRS collection may artificially inflate the mortality estimates and bias in completeness may thus create a false differential in mortality. However, the ITT population is not subject to this limitation and in *post hoc* analysis also shows an odds ratio for mortality of 0.26 (95% CI 0.12-0.57; $p<0.001$). This might be explained by selection of very experienced centres for the study and strict inclusion and exclusion criteria.

Our study has limitations, not all of which could be completely mitigated. Enrolment was disappointing, undermining our expectation that a simple registry approach would

recruit much faster than comparable RCTs. We could not control the balance of thrombectomy to control patients and the rapid uptake of thrombectomy in 2015 compounded the differential enrolment rate. The shortage of control centres after 2015 and the slow uptake of thrombectomy within these may imply other unrecorded deficiencies in acute care. Selection bias to offer thrombectomy to younger, fitter patients and prejudicial assessment of outcomes in favour of thrombectomy may together confound interpretation. However, we introduced rigorous measures to assure comparability of groups at baseline and to protect against bias in outcome assessment. Another limitation is the fact that those patients who had no available video recorded mRS might have experienced systematically different outcomes to those who had video recorded. However, this consideration might not affect the results regarding efficacy and safety, as it is reflected in the analysis of the ITT population. Higher proportion of proximal stenosis in the control compared to thrombectomy group might have also influenced our results. Finally, another limitation is the missing data regarding SICH, which might have some impact in safety outcomes. However, 3m data on death was available in all patients and overall mortality rate was lower in the thrombectomy arm compared to control.

The main strengths of the SITS Open study lie in its testing of clinical practice effectiveness rather than efficacy in a clinical trial setting and in its handling of the design issues, with blinded evaluation of the both baseline neuroimaging and of both the primary outcome (mRS at 90 days) and radiological outcome.

While comparing SITS-OPEN results with the HERMES[6], we could not adjust for baseline data due to lack of access to individual patients' data of the HERMES.

However, the baseline and demography of our SITS Open patients was comparable to that of patients in the treatment arm of the RCTs. Indeed, SITS Open treated patients were slightly older and the percentage of women was higher than in HERMES. Median NIHSS and ASPECT score were similar in both cohorts. In the SITS Open cohort, the percentage of patients who achieved functional independence at 90 days of the index event was slightly higher than the HERMES collaboration. Regarding time to recanalization, it was shorter in SITS Open.[6] Shorter time to revascularization has been associated with better outcomes in real clinical practice registries, so this may indicate that effectiveness of routine use of thrombectomy may improve further as experience and workflow patterns are refined (e.g. direct transportation to thrombectomy centres, improvement on door to punction times, prehospital evaluation).[24, 25]

In conclusion, SITS Open has demonstrated that among patients with acute ischemic stroke due to large vessel occlusion, clinical practice of thrombectomy was associated with greater odds of favourable functional outcome without increased risk of complications. As our study population had very few patients with basilar artery occlusion, our results applied mainly for anterior circulation stroke.

Contributions

N Wahlgren, O Jansen, KR Lees and N Ahmed designed the study. N Ahmed, N Wahlgren and I Escudero-Martinez wrote the initial draft of the manuscript before editing by KRL, RvK and SH. KR Lees advised on the measures to maintain study rigour and statistical approaches. M Bottai performed the statistical analysis. Nils Wahlgren and Olav Jansen were coordinating investigators. N Wahlgren (chair), O Jansen, N Ahmed, S Holmin, KR Lees, S Mangiafico, were Scientific Committee members. R von Kummer was chair of the Neuroimaging Core Laboratory. KR Lees was chair of the Adjudication Committee for mRS. All authors read and commented on the first draft with regard to interpretation of the data and editing of the manuscript and have seen and approved the final version.

Conflict of interest statement

N Ahmed is chair of SITS International, which received a grant from Boehringer Ingelheim for the SITS-ISTR study with alteplase.

N Wahlgren was chair of SITS International until January 2019 which received a grant from Boehringer Ingelheim for the SITS-ISTR study with alteplase. N Wahlgren was coordinating investigator and Steering Committee chairman for SITS Open which received funding from Codman, Covidien/Medtronic, Stryker and Phenox.

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Supplemental Materials

Online Tables I-IX

Online Appendix I-III

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Appendix 1:

Collaborators

Alessandro De Vito, Domenico Consoli, Stefan Müller-Hülsbeck, Satu Mustanoja, Jan-Erik Karlsson, Alexander Rentzos, Tiago Moreira, Yakup Krespi, Sven Poli, Salvatore Mangiafico, Elke Grewski, Ana Paiva Nunes, Isabel Fragata, Lars Krause, Geert Vanhooren, Arnstein Tveiten, Christian Weimar, Gabor Petzold, Sönke Langner, Rafael L Vasconcelos e Castro de Freitas, M. Aguilar, Lucio Castellan, Jayan Chembala, Albrecht Günther, Bo Danielsson

Recruiting centres were S. Anna Hospital Ferrara (Alessandro De Vito) 22 , Jazzolino Hospital (Domenico Consoli) 20, Diakonissenkrankenhaus Flensburg (Stefan Müller-Hülsbeck) 17, Helsinki Central Hospital (Satu Mustanoja) 17, Sahlgrenska University Hospital (Jan-Erik Karlsson, Alexander Rentzos) 16, Karolinska University Hospital (Tiago Moreira) , 16, Memorial Hizmet Hospital (Yakup Krespi) 15, University Hospital Tübingen (Sven Poli) 14, Careggi University Hospital (Salvatore Mangiafico) 12, University Hospital Innsbruck (Elke Grewski) 11, Hospital Sao Jose (Ana Paiva Nunes, Isabel Fragata) 11, Klinikum Osnabrück (Lars Krause) 8, University Hospital Schleswig-Holstein (Olav Jansen) 8, AZ Sin Jan Brugge Oestende (Geert Vanhooren) 7; Sörlandet Sykehus Kristiansand (Arnstein Tveiten) 7, University Klinik Essen (Christian Weimar) 5, University Klinik Bonn (Gabor Petzold) 5, University Klinik

Greifswald (Sönke Langner) 5, Dr Nelio Mendoncha Funchal (Rafael L Vasconcelos e Castro de Freitas) 4, Katharinenhospital (M.Aguilar) 4, San Martino Genova (Lucio Castellan) 4, University Hospital North Staffordshire (Jayan Chembala) 3, University Hospital Jena (Albrecht Günther) 2, Mälarsjukhuset (Bo Danielsson) 1.

Figure legends.

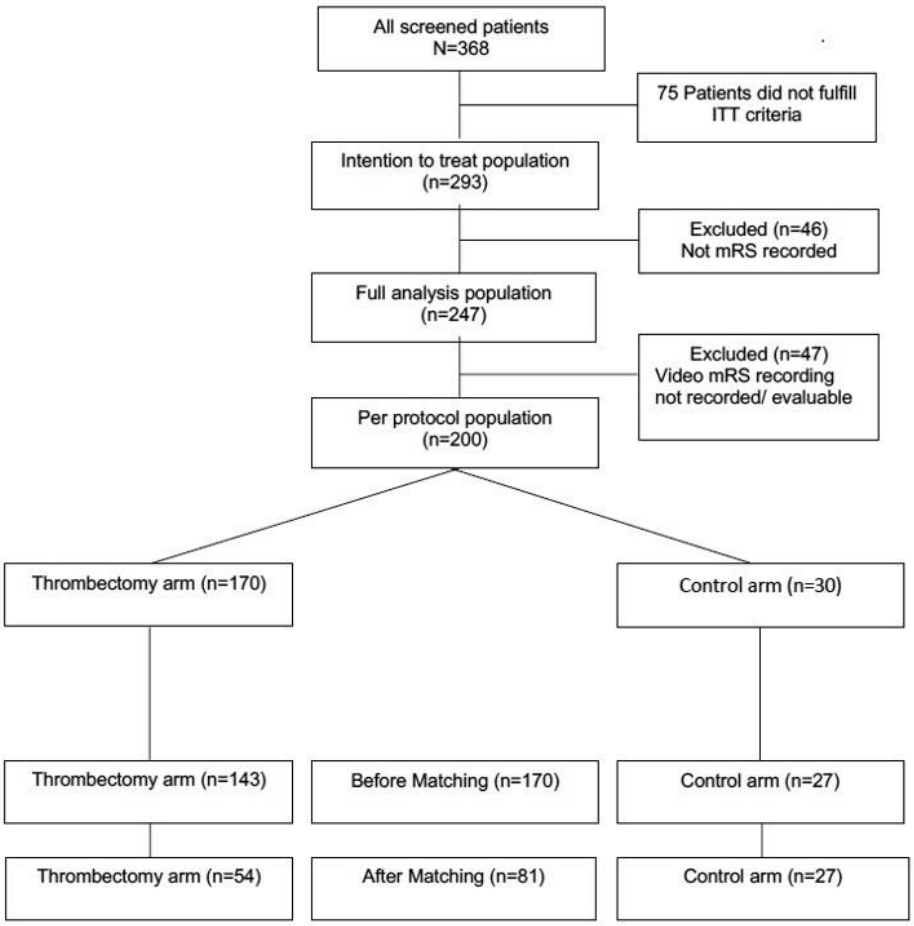

Figure 1. Study flowchart.

Figure 2.

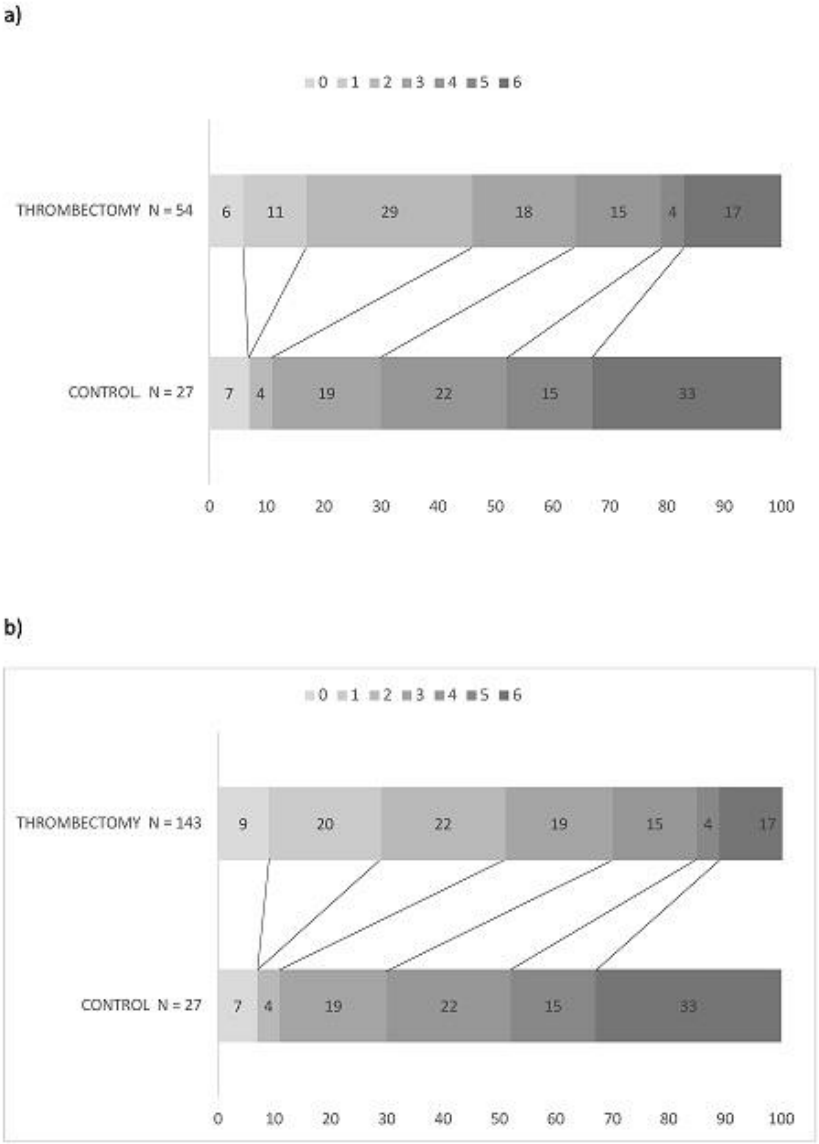

Figure 2. Distribution of the modified Rankin Scale score at 90 days in the per protocol population in the thrombectomy and control groups **a)** after matching, **b)** before matching

TABLES

Table 1. Efficacy and safety outcomes per protocol population

Endpoint	THROMBECTOMY (n=170)	CONTROL (n=30)	OR	95% CI	p-value
Shift mRS at 90 days (before matching)			**4.7**	**2.22-9.87**	**<0.001**
Shift mRS at 90 days (after matching)			**3.8**	**1.61-8.95**	**0.002**
mRs 0-2 at 90 days	**90/170 (52.9%)**	**3/30 (10%)**	10.12	**2.96-34.64**	**<0.001**
mRs 0-1 at 90 days	**51/170 (30%)**	**2/30 (6.7%)**	**6**	**1.38-26.14**	**0.008**
Recanalization TICI 2b-3 after thrombectomy	**93/131 (71%)**	**-**	**-**	**-**	**-**
Time stroke onset – revascularization	**248 (191-305)**	**-**	**-**	**-**	**-**
Recanalization (AOL 2-3) at 24 hours	**97/102 (95.1%)**	**8/19 (42.1%)**	**26.67**	**7.42-95.9**	**<0.001**
Neurological improvement at 12 hours	**7 (1-12)**	**0 (0-2)**	**3.64**	**1.84-7.23**	**<0.001**
Neurological improvement at 24 hours	**9 (4-14)**	**0 (0-4)**	**4.67**	**2.36-9.26**	**<0.001**

Neurological improvement at 7 days	**12 (7-16)**	**3 (2-8)**	**5.16**	**2.23-11.09**	**<0.001**
Reduction in ASPECTS score	**-1 (-2,0)**	**-2 (-5.5,-0.5)**	**3.3**	**1.39-7.7**	**0.007**
Length of in-hospital stay	**9 (6-13)**	**15 (10-17)**	**0.32**	**0.12-0.86**	**0.023**
Recurrent stroke at 90 days	**1/153 (0.6%)**	**0**	-	-	-
Recanalization (AOL 2-3) before EVT	**17/152 (11.2%)**	-	-	-	-
Parenchymal Hemorrhage type 2	4/128 (3.13%)	1/21 (4.76%)	0.65	0.07-6.07	0.702
SICH/mSITS-MOST	3/128 (2.34%)	0	-	-	-
Any PH	11/128 (8.59%)	1/21 (4.76%)	1.88	0.23-15.38	0.556
All cause mortality at 90 days	23/170 (13.53%)	11/30 (36.67%)	0.27	0.11-0.64	0.003
Neurological death at 7 days	6/170 (3.5%)	3/30 (10%)	0.32	0.08-1.37	0.125
Distal embolism/reocclusion	4/104 (3.85%)	2/22 (9.09%)	0.4	0.07-2.33	0.309
Embolism into new territories (ENT)	-	-	-	-	-
Any adverse event related to EVT	2/170 (1.2%)	-	-	-	-

Table 2. Efficacy and safety outcomes full analysis population.

Endpoint	**THROMBECTOMY (n=215)**	**CONTROL (n=32)**	**OR**	**95% CI**	**p-value**
mRs 0-2 at 90 days	**90/171 (52.6%)**	**3/31 (9.7%)**	**10.4**	**3-35.4**	**<0.001**
mRs 0-1 at 90 days	**51/171 (29.8%)**	**2/31 (6.4%)**	**6.2**	**1.4-26.8**	**<0.001**
Recanalization TICI 2b-3 after EVT	**110/162 (67.9%)**	-	-	-	-
Time stroke onset – revascularization	**245 (191-300)**	-	-	-	-
Recanalization (AOL 2-3) at 24 hours	**121/127 (95.3%)**	**9/21 (42.9%)**	**26.9**	**8.2-88.5**	**<0.001**
Neurological improvement at 12 hours	**7 (0-11.5)**	**0 (0-4)**	**2.9**	**1.5-5.5**	**0.001**
Neurological improvement at 24 hours	**9 (-3-14)**	**1 (0-4)**	**3.9**	**2.1-7.4**	**<0.001**
Neurological improvement at 7 days	**11 (7-15)**	**3.5 (2-8)**	**4**	**1.9-8.7**	**<0.001**
Reduction in ASPECTS Score	**-1 (-2,0)**	**-2 (-4,0)**	**2.3**	**1.1-5.1**	**0.03**
Length of in-hospital stay	**8 (6-13)**	**13 (9.5-17)**	**0.4**	**0.2-0.9**	**0.04**
Recurrent stroke at 90 days	1/190 (0.5%)	1/22 (4.5%)	0.11	0-1.84	0.12

Recanalization (AOL 2-3) before EVT	**11/191 (5.8%)**	-	-	-	-
Parenchymal Hemorrhage type 2	7/168 (4.2%)	2/23 (8.7%)	0.46	0.11-2.34	0.35
Any PH	17/168 (10.1%)	2/23 (8.7%)	1.19	0.25-5.48	0.83
SICH/mSITS-MOST	4/168 (2.4%)	0	-		
All cause mortality at 90 days	**24/171 (14%)**	**11/31 (35.5%)**	**0.30**	**0.16-0.94**	**0.04**
Neurological death at 7 days	7/215 (3.3%)	3/32 (9.4%)	0.33	0.08-1.33	0.12
Distal embolism/reocclusion	5/130 (3.8%)	2/24 (8.3%)	0.44	0.08-2.41	0.34
Embolism into new territories (ENT)	-	-			
Any adverse event related to EVT	4/215 (1.9%)	-			

Table 3. Comparison of SITS Open thrombectomy results with thrombectomy arm HERMES collaboration.

Endpoint	**SITS Open (N=170)**	**SITS Open (OR, 95% CI)**	**HERMES (N=633)**	**HERMES (aOR-95% CI)**
Shift mRS at 90 days		4.7 (2.22-9.87)		2.49 (1.76-3.53)
mRs 0-2 at 90 days (%, n)	52.9% (90)	10.12 (2.96-34.64)	46% (291)	2.72 (1.99-3.71)
mRs 0-1 at 90 days (%, n)	30% (51)	6 (1.38-26.14)	26.9% (170)	2.71 (2.07-3.55)
Change in NIHSS from baseline to 24 hours **Mean Change** **Median Change**	 -8.3 (9.3) -9 (-14 to -4)	 4.54 (2.3-8.97)	 -6.4 (8.2) -7 (-12 to -1)	 4.36 (3.03-6.77)
Parenchymal Hemorrhage type 2 (%, n)	3.1% (4)	0.65 (0.07-6.07)	5.1% (32)	1.04 (0.63-1.72)
SICH/mSITS-MOST	2.3% (3)		4.4% (28)	
Death at 90 days (%, n)	13.5% (23)	0.27 (0.11-0.64)	15.3% (97)	0.73 (0.47-1.13)