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ORIGINAL RESEARCH

The Society of Vascular and Interventional Neurology (SVIN) Mechanical Thrombectomy Registry: Methods and Primary Results

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BACKGROUND: A better understanding of real-world practice patterns in the endovascular treatment for large vessel occlusion acute ischemic stroke is needed. Here, we report the methods and initial results of the Society of Vascular and Interventional Neurology (SVIN) Registry.

METHODS: The SVIN Registry is an ongoing prospective, multicenter, observational registry capturing patients with large vessel occlusion acute ischemic stroke undergoing endovascular treatment since November 2018. Participating sites also contributed pre-SVIN Registry data collected per institutional prospective registries, and these data were combined with the SVIN Registry in the SVIN Registry+ cohort.

RESULTS: There were 2088 patients treated across 11 US centers included in the prospective SVIN Registry and 5372 in SVIN Registry+. In the SVIN Registry cohort, the median number of enrollments per institution was 160 [interquartile range 53–243]. Median age was 67 [58–79] years, 49% were women, median National Institutes of Health Stroke Scale 16 [10–21], Alberta stroke program early CT score 9 [7–10], and 20% had baseline modified Rankin scale (mRS)≥2. The median last-known normal to puncture time was 7.7 [3.1–11.5] hours, and puncture-to-reperfusion was 33 [23–52] minutes. The predominant occlusion site was the middle cerebral artery-M1 (45%); medium vessel occlusions occurred in 97(4.6%) patients. The median number of passes was 1 [1–3] with 93% achieving expanded Treatment In Cerebral Ischemia2b50–3 reperfusion and 51% expanded Treatment In Cerebral Ischemia3/complete reperfusion. Symptomatic intracranial hemorrhage occurred in 5.3% of patients, with 37.3% functional independence (mRS0–2) and 26.4% mortality rates at 90-days. Multivariable regression indicated older age, longer last-normal to reperfusion, higher baseline National Institutes of Health Stroke Scale and glucose, lower Alberta stroke program early CT score, heart failure, and general anesthesia associated with lower 90-day chances of mRS0–2 at 90-days. Demographic, imaging, procedural, and clinical outcomes were similar in the SVIN Registry+. A comparison between AHA Guidelines-eligible patients from the SVIN Registry against the Highly Effective Reperfusion evaluated in Multiple Endovascular Stroke Trials study population demonstrated comparable clinical outcomes.

CONCLUSIONS: The prospective SVIN Registry demonstrates that satisfactory procedural and clinical outcomes can be achieved in real-world practice, serving as a platform for local quality improvement and the investigation of unexplored frontiers in the endovascular treatment of acute stroke.

Large vessel occlusion stroke represents 20%–30% of acute ischemic stroke (AIS).[1] Randomized clinical trials have demonstrated that endovascular therapy (EVT) is a powerful tool in reducing disability in large vessel occlusion stroke patients.[2]

The pivotal clinical trials were designed with highly selective inclusion and exclusion criteria. While these designs contributed to the success of the studies and the tremendous effect sizes that they produced, their stringent nature has led to questions regarding their ability to translate into routine clinical practice, whether patients were over selected, and that patients outside these strict criteria would have also benefited from EVT.[2–4] Some of these areas that need further exploration are distal occlusions, milder stroke presentations, large ischemic burden on presentation, changes in workflow, imaging selection paradigms, the implementation of new devices and techniques, amongst others. As such, efforts toward the understanding of the real-world practice patterns related to the use of EVT of stroke are of immediate and pragmatic interest.

We aim to report the methods and initial results of the Society of Vascular and Interventional Neurology (SVIN) Registry, an initiative developed due to the perceived need for an independent and high-quality surveillance system to assess the real-world clinical, imaging, and procedural characteristics as well as clinical outcomes of patients undergoing EVT for AIS.

METHODS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

SVIN Registry Design

In 2016, the SVIN created a task force focused on the development of a prospective EVT registry. In 2018, 4 US sites initiated data entry for a prospective observational registry in the endovascular management of AIS. Additional sites were sequentially added over time (Supplemental methods).

The SVIN Registry is an ongoing prospective, single-arm, multicenter, observational registry evaluating AIS patients undergoing EVT. The registry was designed to capture a full spectrum of clinical, imaging, and procedural characteristics encountered in clinical practice. All consecutive patients with any intracranial vessel occlusion via noninvasive imaging or with suspicion for an arterial occlusion with or without associated symptoms who underwent arterial puncture with intention of EVT were included. The registry

Nonstandard Abbreviations and Acronyms

AIS	acute ischemic stroke
ASPECTS	Alberta stroke program early CT score
eTICI	expanded Treatment In Cerebral Ischemia
EVT	endovascular therapy
MCA	middle cerebral artery
mRS	modified Rankin scale
NIHSS	National Institutes of Health Stroke Scale
SVIN	Society of Vascular and Interventional Neurology

CLINICAL PERSPECTIVE

- The Society of Vascular and Interventional Neurology (SVIN) Registry is an ongoing prospective registry evaluating acute stroke patients undergoing endovascular therapy and was designed to capture a full spectrum of clinical, imaging, and procedural characteristics encountered in clinical practice.

- The SVIN Registry demonstrates that satisfactory procedural and clinical outcomes can be achieved in real-world practice, serving as a platform for local quality improvement and the investigation of unexplored frontiers in the endovascular therapy of acute stroke.

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has an inclusive and pragmatic structure. There were no prespecified requirements of imaging selection, device or technique use, treatment time window, baseline level of functional status, pretreatment stroke clinical severity, minimal center, or operator annual volumes.

All sites instituted and maintained locally approved Institutional Review Board-compliant databases allowing for sustainable and prospective data collection via real-time data entry utilizing a comprehensive clinical research form that defined mandatory and optional variables utilizing REDCap (Research Electronic Data Capture; Vanderbilt University, TN). The REDCap platform is a secure, Health Insurance Portability and Accountability Act (HIPAA) compliant, web-based platform designed for research data capture, and was chosen for the standardization of data vocabulary between sites. Data were collected and managed using the REDCap tools hosted at each site. Participating centers were instructed to enter procedural data in real-time to maximize accuracy. Data quality checks were systematically performed to ensure continuous data entry and completeness. New data were exported to the coordinating center, which verified data integrity/quality and merged if minimum standards were met. Mandatory variables are expected to have a completion of 98%, with the exception of 90-day modified Rankin scale (mRS) with an expected completion rate of greater than 80%. The SVIN Registry has a consortium chair and 2 vice-chairs, forming along with the local principal investigators the Steering Committee, which guided the development of bylaws, and approved protocol development and modifications (Supplemental methods).

EVT of stroke encompassed any technique utilized aiming to reestablish normal cerebral perfusion. Large vessel occlusion stroke was defined as steno-occlusive lesions involving the intracranial internal carotid artery or the proximal portion of the middle cerebral artery (MCA, M1- or M2-segment), as well as the vertebral or basilar arteries. Medium vessel occlusion strokes were defined as steno-occlusive lesions involving the anterior cerebral artery, the M3 or M4 segments of the MCA, or the posterior cerebral artery. The National Institutes of Health Stroke Scale (NIHSS) was utilized to grade stroke severity, the mRS score scale[5] to determine functional status, the Alberta stroke program early CT score (ASPECTS) scale[6] for ischemic burden stratification on CT or MR imaging, and the expanded Treatment In Cerebral Ischemia (eTICI) scale[7] for the degree of reperfusion. Symptomatic intracranial hemorrhage was defined as per the ECASS 3 Trial definition (eg, any extravascular blood in the brain or within the cranium associated with deterioration in NIHSS score of ≥ 4 points, or that leads to death and is identified as the predominant cause of the neurologic

deterioration).[8] Intracranial hemorrhages were further classified according to their radiographic appearance as per the Heidelberg classification.[9] The primary outcome measure was the rate of functional independence (mRS0–2) at 90 days (± 14 days). Secondary outcomes included the rates of successful (eTICI2b-3) and complete (eTICI3) reperfusion, as well as first pass effect (eTICI3 with 1 pass), and modified first pass effect (eTICI2b-3 with 1 pass). Safety outcomes included the proportion of symptomatic intracranial hemorrhage, parenchymal hematoma type-2, and 90-day mortality.

"SVIN Registry+"

Centers with a thrombectomy database instituted before the inclusion in the SVIN Registry were offered to have their database re-coded by a data analyst to match with the SVIN Registry data dictionary (sponsored by the SVIN). The study period spanned from January 2012 (the time that modern thrombectomy devices became broadly available in the United State) or when local prospective data collection was instituted, if later than January 2012, up to the moment the center formally joined the SVIN Registry. The combination of this data set plus the SVIN Registry was termed "SVIN Registry+."

Data Analysis

Continuous variables were reported as mean±standard deviation or median [interquartile range] as appropriate. Categorical variables were reported as frequencies and percentages. Normality of distributions was assessed by the Shapiro–Wilk test. Comparisons of continuous and ordinal variables were made with Mann–Whitney U test or Wilcoxon signed-rank test as appropriate. Categorical variables were compared using Pearson X^2 or Fisher exact as appropriate.

The primary population of the study was derived from the SVIN Registry data set. Secondary analyses were performed utilizing the SVIN Registry+ as the target population. The overall baseline, imaging, and procedural characteristics as well as clinical outcomes were described. The mRS was determined either in person or via a structured phone interview.[10] Multivariable regression models were performed to evaluate the association of different variables with functional independence and mortality at 90 days. Variables significant to $P<0.1$ in the univariate analysis were assessed by a backward stepwise logistic regression analysis to identify the covariates that best predict 90-day functional independence in a final model. Similarly, multivariable regression analysis for the predictors of 90-day mortality was performed. Significance was set at $P<0.05$, and all P values were based on 2-tailed tests. Statistical

analyses were performed using SPSS 26 software (IBM Armonk, NY).

The SVIN Registry American Heart Association early window guidelines-eligible patients (baseline NIHSS ≥6, baseline ASPECTS ≥6, intracranial intracranial internal carotid artery or MCA-M1 occlusions, premorbid mRS 0–1, and time from last known well to arterial puncture <6 hours) were compared with the HERMES (Highly Effective Reperfusion evaluated in Multiple Endovascular Stroke Trials) patients who underwent thrombectomy. Dichotomous outcomes were analyzed using the number of events in each group and the total number of participants in order to calculate the risk ratio. For continuous variables, the means and standard deviations from each study were used to calculate the mean difference. A random-effects model was utilized. Analyses were performed with RevMan (version 3.5.0, Information Management Systems Group, Cochrane Collaboration, and Oxford, UK).

RESULTS

A total of 2088 patients treated across 11 US centers were included within the study period (November 2018–December 2020) (Supplemental Figure S1). The median number of enrollments in the SVIN Prospective Registry was 127 for the month of December 2020. The median total number of enrollments per institution was 160 [53–243] patients.

The baseline characteristics of the SVIN Registry population are depicted in Table 1. The median age was 67 [58–79] years and 49% were women. The median baseline NIHSS was 16 [10–21]. The median baseline ASPECTS was 9 [7–10]. One-fifth of the patients had baseline mRS≥2. The median time from last known well to puncture was 7.7 [3.1–11.5] hours, with 49.9% treated >6 hours of time from last known well, and the median time from puncture to reperfusion was 33 [23–52] minutes. The predominant occlusion site was the MCA-M1 (45%). Medium vessel occlusion strokes treatment occurred in 97 (4.6%) patients.

Transradial access was pursued in 86 (4.1%) patients while direct carotid puncture occurred in 15 (0.7%). The median number of passes was 1 [1–3]. The rate of successful (eTICI2b50-3) reperfusion was 93%, while complete (eTICI3) reperfusion was achieved in 51% of the patients. Symptomatic intracranial hemorrhage and parenchymal hematoma type-2 were observed in 5.3% and 1.8% of the patients, respectively. The rate of functional independence at 90 days was 37.3% while 90-day mortality was 26.4%.

Multivariable regression analysis indicated older age, longer time from last normal to reperfusion, higher

TABLE 1. Baseline Characteristics and Outcomes Among SVIN Registry and SVIN Registry+ Cohorts

Variables	SVIN Registry N=2088	SVIN Registry+ N=5372
Age		
Median [IQR]	68.5 [58–79]	68 [57–79]
Sex, n (%)		N=5365
Male	1069 (51.2)	2809 (52.4)
Female	1019 (48.8)	2556 (47.6)
Race or ethnicity n (%)		
Non-Hispanic White	936 (44.8)	2541 (47.3)
Non-Hispanic Black	550 (26.3)	1394 (25.9)
Hispanic of any race	175 (8.4)	750 (14)
Non-Hispanic Asian	52 (2.5)	130 (2.4)
Unknown	311 (14.9)	557 (10.4)
BMI	N=1516	N=4077
Median [IQR]	27.78 [24.13–32.61]	27.85 [24.21–32.3]
Initial blood glucose (mg/dL)	N=2022	N=4017
Median [IQR]	127 [108–161]	126 [107–158]
Hypertension, n (%)	1591 (76.2)	4004 (74.5)
Diabetes, n (%)	651 (31.2)	1618 (30.1)
Dyslipidemia, n (%)	815 (39)	2139 (39.8)
Coronary artery disease, n (%)	404 (19.3)	766 (14.3)
Congestive heart failure, n (%)	317 (15.2)	487 (9.1)
Atrial fibrillation, n (%)	602 (28.8)	1616 (30.08)
Current smoking, n (%)	405 (19.4)	1051 (19.6)
Stroke cause, n (%)		
Cardioembolic	839 (40.2)	1952 (50.1)
ICAD	207 (9.9)	363 (9.3)
Large artery atherosclerosis	145 (6.9)	468 (12)
Arterial dissection	27 (1.3)	84 (2.2)
Other determined cause	118 (5.7)	240 (6.2)
ESUS	752 (36.0)	790 (20.3)
Premorbid mRS, n (%)		
0	1426 (69.6)	3018 (71.2)
1	252 (12.3)	521 (12.3)
2	172 (8.4)	344 (8.1)
3	143 (6.9)	262 (6.2)
4	42 (2.0)	76 (1.8)
5	11 (0.5)	18 (0.4)
Intravenous thrombolysis, n (%)	737 (35.9)	1970 (37.6)
Baseline ASPECTS Median [IQR]	9 [7–10]	8 [7–10]
Baseline ASPECTS		
0–5	116 (7.5)	300 (8)
6–10	1429 (92.5)	3469 (92)
Baseline NIHSS score Median [IQR]	16 [10–21]	17 [11–21]
TLKW-puncture (min) Median [IQR]	335 [190–692.75]	365 [222–679.5]

(Continued)

TABLE 1. (Continued)

Variables	SVIN Registry N=2088	SVIN Registry+ N=5372
Time puncture to reperfusion (min)		
Median [IQR]	33 [23–52]	38 [25–63]
CTA collateral score on single phase, n (%)	n=724	n=1515
0	43 (5.9)	82 (5.4)
1	175 (24.2)	321 (21.2)
2	315 (43.5)	607 (40.1)
3	167 (23.1)	390 (25.7)
4	24 (3.3)	115 (7.6)
Occlusion location, n (%)		
Isolated extracranial ICA	52 (2.5)	143 (2.7)
Intracranial ICA	450 (21.6)	952 (17.7)
MCA-M1	946 (45.3)	2598 (48.4)
MCA-M2	417 (20)	982 (18.3)
MCA-M3	44 (2.1)	106 (2)
ACA	17 (0.8)	49 (0.9)
Basilar	126 (6)	421 (7.8)
PCA	36 (1.7)	67 (1.2)
Multi vessel occlusion	0 (0)	54 (1)
Automated CT perfusion	N=1236 59%	N=2344 43%
rCBF<30% (cc)		
Median [IQR]	6 [0–26]	6 [0–25]
$T_{max}>6$ s (cc)		
Median [IQR]	110 [59.25–170]	117 [66–176]
$T_{max}>10$ s (cc)	N=729	N=1933
Median [IQR]	36 [9–81]	45 [15–90]
General anesthesia, n (%)	824/2079 (39.6)	1618/4760 (34)
Access site n (%)		
Femoral	1774 (85)	4371(81.4)
Radial	86 (4.1)	142 (2.6)
Direct carotid	15 (0.7)	35 (0.7)
Brachial	3 (0.1)	5 (0.09)
Number of passes		
Mean±SD	1.9±1.4	2±1.4
Median [IQR]	1 [1–3]	2 [1–3]
FPE (eTICI2C-3)	791/2076 (38.1)	1781/5326 (33.4)
mFPE (eTICI2B50-3)	967/2076 (46.6)	2358/5326 (44.3)
Successful reperfusion, n (%) eTICI2b50-3	1930/2076 (93)	4837/5326 (90.8)
Full reperfusion eTICI3, n (%)	1076/2076 (51.5)	2734/5326 (51.3)
Near/full reperfusion eTICI2c-3, n (%)	1387/2076 (66.4)	3216/5326 (60.4)
Intracerebral hemorrhage, n (%)	657/2061 (31.9)	1528/5238 (29.2)
PH type 1, n (%)	70/2061 (3.4)	184/5238 (3.5)
PH type 2, n (%)	37/2061 (1.8)	156/5238 (3)
SICH n (%)	109/2061(5.3)	277/5238 (5.3)
24 h NIHSS score	N=1262	N=3883
Median [IQR]	9 [3–17]	10 [4–18]
Discharge mRS 0–2, n (%)	567/1988 (28.5)	1447/4919 (29.4)

(Continued)

TABLE 1. (Continued)

Variables	SVIN Registry N=2088	SVIN Registry+ N=5372
90-d mRS 0–2, n (%)	651/1745 (37.3)	1800/4463 (40.3)
90-d mRS 0–3, n (%)	932/1745 (53.4)	2433/4463 (54.5)
90-d Mortality, n (%)	460/1745 (26.4)	1179/4463 (26.4)

ACA indicates anterior cerebral artery; BMI, body mass index; ESUS, embolic stroke of undetermined source; eTICI, expanded Treatment In Cerebral Ischemia; FPE, first pass effect; ICA, intracranial internal carotid artery; ICAD, intracranial atherosclerotic disease; IQR, interquartile range; MCA, middle cerebral artery; mFPE, modified first pass effect; mRS, modified Rankin scale; NIHSS, National Institutes of Health Stroke Scale; PCA, posterior cerebral artery; PH, parenchymal hematoma; SICH, symptomatic intracranial hemorrhage; and TLKW, time from last known well time last known normal.

TABLE 2. Multivariable Analysis for Predictors of Functional Independence (mRS0–2) and Mortality at 90 Days From in the SVIN Registry

Independence	OR	95% CI	*P* value
Age	0.972	0.963–0.982	<0.001
TLKW to reperfusion	0.999	0.999–0.999	<0.001
Initial blood glucose	0.995	0.993–0.998	<0.001
Baseline NIHSS score	0.908	0.887–0.928	<0.001
Baseline ASPECTS	1.145	1.044–1.256	0.004
Congestive heart failure	0.418	0.269–0.651	<0.001
General anesthesia	0.492	0.360–0.673	<0.001
Mortality	**OR**	**95% CI**	***P* value**
Age	1.070	1.054–1.087	<0.001
Baseline NIHSS score	1.095	1.063–1.128	<0.001
Baseline ASPECTS	0.808	0.718–0.910	<0.001
Initial blood glucose	1.003	1.000–1.006	0.03
Congestive heart failure	1.883	1.179–3.006	0.008
Hypertension	0.500	0.298–0.840	0.009
Intravenous thrombolysis	0.691	0.455–1.051	0.08
Vertebrobasilar occlusion	4.486	1.243–16.188	0.02
General anesthesia	1.492	0.978–2.276	0.06

ASPECTS indicates Alberta stroke program early CT score; NIHSS, National Institutes of Health Stroke Scale; OR, odds ratio; SVIN, Society of Vascular and Interventional Neurology; and TLKW, time from last known well time last known normal.

baseline NIHSS, higher baseline glucose, lower baseline ASPECTS, the presence of congestive heart failure, and the use of general anesthesia were associated with lower chances of functional independence at 90 days. Older age, higher baseline NIHSS, lower baseline ASPECTS, higher baseline glucose, presence of congestive heart failure or hypertension, lack of use of IV thrombolysis, and posterior circulation occlusions were independently associated with higher 90-day mortality (Table 2).

The SVIN Registry+ encompassed 5372 patients, most of whom (95%) were collected prospectively. Demographic, imaging, and procedural characteristics as well as clinical outcomes were comparable to the primary SVIN Registry data set (Table 1). Predictors of

TABLE 3. Comparison of Baseline Characteristics and Outcomes Among AHA Guidelines Eligible Patients in SVIN Registry Versus HERMES Meta-Analysis Population

	AHA Guidelines eligible cohort N=399	HERMES study population[2,11] N=634	*P* value
Age, y median [IQR]	66 [56–76] 66.0±14.8	68 [57–77] 66.3±13.2	0.74
Sex, n (%) Men Women	217 (54.4) 182 (45.6)	330 (52) 304 (48)	0.46
Hypertension, n (%)	297 (74.4)	352 (56)	<0.001
Diabetes, n (%)	103 (25.8)	82 (13)	<0.001
Atrial fibrillation, n (%)	112 (28)	209 (33)	0.098
Smoking	87 (21.8)	194 (31)	0.002
Baseline NIHSS score median [IQR]	17 [12–22] 17.0±7.4	17 [14–20] 16.8±5.1	0.64
Baseline ASPECTS median [IQR]	9 [8–10] 9.0±1.4	9 [7–10] 8.3±1.7	<0.001
Occlusion location, n (%) ICA MCA-M1 MCA-M2 Others	129 (32.3) 270 (67.7) NA NA	133 (21) 439 (69) 51 (8) 11 (2)	0.002
Intravenous thrombolysis, n (%)	223/396 (56.3)	526 (83)	<0.001
TLKW to reperfusion median [IQR]	228 [174–295] 232.5±90.0	285 [210–362] 285.7±112.9∗	<0.001
Successful reperfusion eTICI2b-3	376/398 (94.5)	402/570 (71)	<0.001
90-d mRS 0–2, n (%)	152/339 (44.8)	291/633 (46)	0.735
SICH, n (%)	24/396 (6)	28/634 (4.4)	0.241
PH type 2	11/396 (2.8)	32/629 (5.1)	0.073
90-d mortality, n (%)	62/339 (18.3)	97/633 (15.3)	0.234

ASPECTS indicates Alberta stroke program early CT score; HERMES, Highly Effective Reperfusion evaluated in Multiple Endovascular Stroke Trials; ICA, intracranial internal carotid artery; IQR, interquartile range; MCA, middle cerebral artery; mRS, modified Rankin scale; NIHSS, National Institutes of Health Stroke Scale; PH, parenchymal hematoma; SD, standard deviation; SICH, symptomatic intracranial hemorrhage; SVIN, Society of Vascular and Interventional Neurology; and TLKW, time from last known well time last known normal.

*Mean (SD) transformed from median.[12,13]

functional independence and mortality at 90-day are depicted in the Supplemental Table S1.

The comparison between AHA Guidelines-eligible patients from the SVIN Registry versus the HERMES Study Population demonstrated comparable age, sex, baseline NIHSS, and frequency of atrial fibrillation. The SVIN Registry patients were more commonly hypertensive and diabetic, and less frequently smokers. Baseline ASPECTS and the frequency of intracranial intracranial internal carotid artery occlusions were lower in the HERMES cohort. The SVIN Registry population less commonly received IV thrombolysis and had shorter time from last known well to reperfusion than did the HERMES cohort. The rates of postprocedural symptomatic intracranial hemorrhage and parenchymal hematoma type-2 as well as functional independence and mortality at 90 days were comparable across the 2 groups (Table 3).

DISCUSSION

The SVIN Registry is an ongoing, investigator-driven, prospective, multicenter, pragmatic study designed to advance the existing understanding of EVT through research and to provide a pragmatic tool for hospitals to analyze, report, and improve quality of patient care at a local level. This initial analysis of our data set, which at present represents one of the largest EVT registries ever created, demonstrates that satisfactory procedural and clinical outcomes can be achieved in real-world practice. Our study adds to the growing body of evidence confirming not only the efficacy but also the effectiveness of EVT in ischemic stroke.

A meta-analysis of the landmark thrombectomy trials demonstrated that the number-needed-to-treat with endovascular thrombectomy to reduce disability by at least 1 level on mRS was 2.6 in patients

presenting within the early therapeutic window.[2] A pooled analysis of late presenting stroke trials led to similar results, with a number needed to treat of 3 to reduce disability at least 1 level on mRS.[14] The patients enrolled in these trials were highly selected, requiring evidence of small ischemic cores on noninvasive imaging, proximal occlusions (mostly intracranial internal carotid artery or proximal MCA), good pre-morbid functional status, and being treated in selected centers. Moreover, many of the trials excluded patients on the basis of older age, stroke severity, presence of comorbidities, and coexistent proximal arterial stenosis. Therefore, understanding the potential outcomes and safety of nonstandard indications is critical due to the reasonable likelihood of overselection based on presently accepted standard indications.[15]

Since the publication of those trials, industry-sponsored prospective registries contributed to our knowledge of the impact of EVT. However, some of these studies had limitations related to being device-specific and not mandating consecutive inclusion.[16,17] Furthermore, part of them had to adopt more restrictive inclusion criteria due to regulatory requirements.[16] These restrictions likely explain the higher rates of independence (mRS0–2) at 90-days (55% in the TREVO Registry and 56% in the STRATIS [Systematic Evaluation of Patients Treated With Neurothrombectomy Devices for Acute Ischemic Stroke] registry as compared with 37% in the SVIN Registry) despite comparable rates of successful reperfusion/TICI2b-3 (87% in STRATIS, 92% in TREVO, and 93% in the SVIN Registry).[16,17] The ROSSETTI (Spanish Registry of Combined versus Single Thrombectomy Techniques) Registry also limits the inclusion based on the baseline level of functionality, occlusion site, time from last-normal to puncture, and stroke severity at presentation, leading to higher relative rates of mRS0–2 at 90-days (56%).[18] Other efforts such as the retrospective NASA (North American Solitaire Stent Retriever Acute Stroke) registry and the TREVO stent-retriever mechanical thrombectomy for AIS secondary to large vessel occlusion registry (TRACK), as well as the prospective MR CLEAN (Multicenter Randomized Controlled Trial of Endovascular Treatment for Acute Ischemic Stroke), ETIS (Endovascular Treatment in Ischemic Stroke), and STAR (Stroke Thrombectomy and Aneurysm Registry) registries have circumvented some of these limitations. Independence rates at 90-days rates are comparable (42% NASA,[19] 48% TRACK,[20] 38% MR CLEAN,[21] 34% STAR,[22] and 44% ETIS[23]) to the SVIN Registry, characterizing these efforts as adequate platforms for scientific exploration.

Despite technical and technological advancements and improvements in treatment workflow, there remain significant limitations to the current EVT approaches in clinical practice. In fact, approximately 50% of the treated patients remain with significant long-term disability despite the highly selective treatment paradigms utilized on the landmark randomized trials.[2] Improvements in the methods to estimate ischemic core,[24,25] optimization in both first pass[26] and final reperfusion rates,[7] and reduction of door-to-puncture times[27] exemplify some strategies that might lead to better outcomes in the currently treated patient population. Moreover, treatment indication expansions to include larger ischemic cores, medium vessel occlusion strokes, and large vessel occlusion stroke presenting with mild clinical severity will hopefully extend the benefit of EVT to a large proportion of stroke patients. Future SVIN registry studies are planned to explore these questions.

Despite being a large, multicenter, and prospectively maintained data set, there are limitations inherent to the observational and pragmatic nature including the self-adjudicated estimation of reperfusion rates and the loss of a proportion of patients to follow-up as compared to controlled trials. The lack of core-lab estimation of ischemic core volume is a weakness that can be partially controlled by the large relative number (59%) of patients having undergone CT perfusion with automated postprocessing. The lack of a medical arm of patients limits our ability to estimate a treatment effect. The comparable clinical outcomes between the SVIN Registry meeting American Heart Association Guidelines eligible cohort with the HERMES meta-analysis reinforce the reliability of the current data set.

The SVIN Prospective Registry is a large and robust platform. In this first analysis of the cohort, we demonstrate that adequate procedural and clinical outcomes can be achieved in the real-world practice in the EVT of AIS. We anticipate that the SVIN Registry will continue to serve as a platform for improvement of local quality of patient care, and in future analyses, further the investigation of unexplored frontiers in the EVT of AIS.

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