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Impact of age on mechanical thrombectomy and clinical outcome in patients with acute ischemic stroke

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Background and purpose: Mechanical thrombectomy is less effective in patients aged 80 years or older. Our goal was to better understand the impact of age in general on recanalization rates and clinical outcome. *Methods:* We performed a retrospective analysis of our prospective database of adult patients with acute ischemic stroke due to large vessel occlusions, who had undergone mechanical thrombectomy between 2019 and mid-2021. The cohort was categorized into five age groups: 18 − 49, 50 − 59, 60 − 69, 70 − 79 and ≥ 80 years. Our primary outcome measure was clinical outcome at three months after mechanical thrombectomy, measured by the mRS score. Secondary outcomes were procedure times and rates of successful recanalization, defined by mTICI ≥ 2b. *Results:* Data of 264 patients were analyzed. There were no significant differences in procedure times (p = 0.46) or in rates of successful recanalization (p = 0.49) between age groups. There was a significant association of age and mRS score at three months (p < 0.0001): From youngest to oldest group, odds of functional independence (mRS ≤ 2) decreased (80.0% vs. 21.3%) and odds of death (mRS 6) increased (13.3% vs. 57.3%). Increasing age was significantly associated with lower rates of functional independence (OR 0.93; [95% CI 0.90 − 0.95]), higher rates of care dependency (OR 1.04; [95% CI 1.01 − 1.07]) and higher mortality rates (OR 1.06; [95% CI 1.04 − 1.09]). *Conclusion:* Higher age had no significant impact on recanalization times or recanalization rates but was strongly associated with worse clinical outcome after mechanical thrombectomy.

Keywords: Acute ischemic stroke—Large vessel occlusion—Mechanical thrombectomy—Age-related outcome

Introduction

Mechanical thrombectomy (MT) has proven to be an effective and safe treatment for patients with acute ischemic stroke due to large vessel occlusion and its use has therefore rapidly increased over the past decade.[1−3] Although MT has been demonstrated to be effective independent of age, age seems to strongly affect clinical outcome after MT.[1]. The reasons are manifold. Besides the natural process of aging, elderly patients tend to have more significant comorbidities, such as atherosclerosis, arterial hypertension and diabetes mellitus, all influencing brain plasticity, arterial collateral network and the ability to recover in general.[4,5] These factors may also lead to remodelling of the vasculature, and as such, increased technical difficulty of and eventually longer procedure times of MT.[6] Several studies have shown lower

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functional outcome and higher mortality rates in older patients after MT. However, patients are typically divided into groups of < 80 and ≥ 80 years, leaving age-related differences within the large group of < 80 unclear.[7−10] Furthermore, analyses of differences in procedure times and reperfusion rates between multiple age groups have been performed infrequently and available findings are inconclusive, although these two factors have been clearly associated with clinical outcome.[11,12] The aim of this study was to explore clinical outcome, procedure times and recanalization rates across the total age range of adult stroke patients and to gain a more profound understanding of age-related effects on MT.

Methods

Study population

We conducted a retrospective study on consecutive adult patients with acute ischemic stroke (AIS) caused by large vessel occlusion (LVO), treated with MT at a comprehensive stroke centre between January 1, 2019, and September 14, 2021. The decision for MT was taken according to the international guidelines for MT.[13,14] In borderline cases, such as medium vessel occlusion, low NIHSS and low Alberta Stroke Program Early CT Score (ASPECTS), the treatment decision was made through agreement between stroke neurologists and neurointerventionalists. Patient data was extracted from the prospectively collected database of MT-patients, from the electronic patient information records and from the Swiss Stroke Registry (SSR), a prospective database with stroke patient data of all certified Swiss stroke centres. The study was approved by the regional ethics committee, under the number 2014-0304. Patients refusing to participate were excluded from the analysis.

Patient selection

Patients with a LVO of both anterior and posterior circulation, confirmed by computed tomographic angiography (CTA) or magnetic resonance angiography (MRA), were included in the analysis. Time from last-seen-well to reperfusion was restricted to ≤ 24h. Occlusions of the internal carotid artery (ICA), middle cerebral artery (segments M1-M3), anterior cerebral artery (segments A1-A3), vertebral artery (VA), basilar artery (VA) and posterior cerebral artery (segments P1-P2) were included. Patients eligible for intravenous thrombolysis therapy (IVT) received standard-dosing (0.9mg/kg body weight) intravenous alteplase before MT. MT was performed with stent retrievers, direct aspiration or the combination of the two, based on the individual decision of the interventionalist. Patients with spontaneous recanalization before MT were excluded. Clinical re-evaluation and follow-up imaging of patients were conducted approximately three months after MT procedure.

Data collection

We assessed baseline characteristics, MT performance variables and clinical outcome of included patients. These variables are displayed in Table 1 and 2.

To evaluate stroke severity at admission, the NIHSS was used. As an estimation of symptom onset, we used the time of last-seen-well. We categorized occlusion location into anterior circulation and posterior circulation. Complete or nearly complete recanalization after one single MT-device-pass was defined as the first-pass effect (FPE).[15] We included the following risk factors (RF) into our analyses: medical history of hypertension, diabetes mellitus, hyperlipidemia, smoking and atrial fibrillation. Stroke aetiology was described by the TOAST classification: Large vessel atherosclerosis, cardioembolism, stroke of other determined aetiology and stroke of undetermined aetiology, corresponding to TOAST 1, 2, 4 and 5. Prestroke disability was not available due to incomplete records of patients transferred from regional hospitals.

Outcomes

Our primary outcome measure was clinical outcome three months after MT, described by the Modified Rankin Scale score (mRS). We defined favorable outcome as mRS 0-2 (functional independence) and unfavorable outcome as mRS > 2. Unfavorable outcome was further divided into mRS 3-5 (care dependency) and mRS 6 (death of the patient).

Secondary outcomes were procedure time (PT) and rates of successful recanalization (RR). Procedure time was defined as time from groin puncture to angiographic reperfusion or, in case of failed recanalization, as time from groin puncture to the end of procedure. Successful recanalization was defined as an mTICI score of ≥ 2b. Unfavorable outcome despite mTICI ≥ 2b was defined as futile recanalization.[16]

Statistical analyses

In order to compare our results to findings in previous studies, we first examined baseline characteristics and aforementioned outcomes in patients < 80 and ≥ 80 years and then across five smaller age-subgroups: 18 - 49, 50 - 59, 60 - 69, 70 - 79 and ≥ 80 years. We chose cut-offs in accordance with the definition of stroke in young adults (< 50 years)[2,17] and the grouping in the HERMES study.[1] We performed all analyses and created all Figs in R Statistical Software, version 4.2.1; R Core Team 2022. Tables were created in Microsoft Word.

As Shapiro-Wilk tests and visual inspection of q-q plots revealed non-normal distribution of all our continuous variables (NIHSS at admission, last-seen-well-to-groin-puncture and PT), we used Mann-Whitney U tests to compare these variables between < 80 and ≥ 80 and Kruskal-Wallis tests to compare the five age groups. Results are

Table 1. *Baseline characteristics.*

Variables	Overall sample (N = 264)	18 - 80 (N = 185)	≥ 80 (N = 79)	p value*	18-49 (N = 17)	50-59 (N = 31)	60-69 (N = 61)	70-79 (N = 76)	p value†
Age in years (median, IQR)	72 (63-81)	68 (58-73)	86 (82.5-89)		42 (35-46)	55 (51.5-57)	65 (62-68)	75 (72-77)	
Male sex (No. (%))	143 (54.2)	109 (59)	34 (43)	0.022	12 (70.6)	17 (54.8)	32(52.5)	48 (63.2)	0.081
NIHSS at admission (median, IQR)	13 (7-17)	12 (6-17)	13.5 (8-18)	0.086	12 (6-16)	12 (7-17)	12 (7-16)	13(6-17)	0.437
Last-seen-well-to-groin-puncture in min (median, IQR)	279 (193-514)	269 (190-500)	335 (219-561)	0.246	300 (189-451)	327 (177.5-436.5)	251 (183-535)	273.5 (205-533)	0.689
Anterior / posterior circulation stroke (No. (%))	245 (92.8) / 16 (6.1)	169 (91.3) / 14 (7.6)	76 (96.2) / 2 (2.5)	0.260	17 (100)	27 (87.1) / 3 (9.7)	57 (93.4) / 4 (6.6)	68 (89.5) / 7 (9.2)	0.410
IVT (No. (%))	76 (28.8)	54 (29.2)	22(27.8)	0.883	5(29.4)	7(22.6)	22 (36.1)	20 (26.3)	0.674
AIS risk factors (No. (%)):	135 (58.2)	84 (50.9)	51 (76.1)	0.0004	5 (33.3)	10 (35.7)	31 (55.4)	38 (57.6)	0.0008
Hypertension	28 (12.1)	17 (10.3)	11 (16.4)	0.265	1 (6.7)	3 (10.7)	4 (7.1)	9 (13.6)	0.602
Diabetes mellitus	93 (40.1)	69 (41.8)	24 (35.8)	0.461	7 (46.7)	15 (53.6)	24 (42.9)	23 (34.8)	0.427
Hyperlipidemia	57 (24.6)	50 (30.3)	7 (10.4)	0.001	5 (33.3)	12 (42.9)	20 (35.7)	13 (19.7)	0.001
Smoking	88 (37.9)	43 (26.1)	45 (67.2)	< 0.0001	0	2 (7.1)	11 (19.6)	30 (45.5)	< 0.0001
Atrial fibrillation									
TOAST classification of stroke	56 (19.3)	41 (22.2)	15 (19.0)	0.624	1 (5.9)	9 (29.0)	16 (26.2)	15 (19.7)	0.312
aetiology (No. (%)):	108 (38.6)	63 (34.1)	45 (57.0)	0.0006	7 (41.2)	10 (32.3)	13 (21.3)	33 (43.4)	0.0005
LVA (TOAST 1)	24 (9.1)	22 (11.9)	2 (2.5)	0.018	6 (35.3)	4 (12.9)	7 (11.5)	5 (6.6)	0.002
Cardioembolic (TOAST 2)	76 (28.8)	59 (31.9)	17 (21.5)	0.103	3 (17.6)	8 (25.8)	25 (41)	23 (30.3)	0.116
Other (TOAST 4)									
Cryptogenic (TOAST 5)									

Abbreviations: NIHSS = National Institutes of Health Stroke Scale; IVT = intravenous thrombolysis; AIS = acute ischemic stroke; TOAST = Trial of Org 10172 in Acute Stroke Treatment; LVA = large vessel atherosclerosis.

*Comparison of < 80 vs. ≥ 80.

Table 2. *MT performance variables and clinical outcome.*

Variables	Overall sample (N = 264)	18 - 80 (N = 185)	≥ 80 (N = 79)	p value*	18-49 (N = 17)	50-59 (N = 31)	60-69 (N = 61)	70-79 (N = 76)	p value†
PT in min (median, IQR)	67 (40-112)	65 (40-113)	76 (35-111)	0.955	61 (42-116)	54 (35-85)	70 (47-120)	67 (40-111)	0.445
mTICI ≥ 2b (No. (%))	240 (90.9)	170 (91.9)	70 (88.6)	0.483	14 (82.4)	28 (90.3)	57 (93.4)	71 (93.4)	0.490
mTICI ≥ 2c (No. (%))	197 (74.6)	137 (74.1)	60 (75.9)	0.877	11 (64.7)	26 (83.9)	40 (65.6)	60 (78.9)	0.223
FPE	111 (42.7)	72 (39.6)	39 (50)	0.133	7 (41.2)	10 (32.3)	23 (38.3)	32 (43.2)	0.475
mRS at 3 months follow-up‡:									
mRS 0-2	106 (42.9)	90 (52.3)	16 (21.3)	< 0.0001 (OR 4.02, CI 2.09-8.11)	12 (80.0)	22 (73.3)	30 (51.7)	26 (37.7)	< 0.0001
mRS 3-5	47 (19.0)	31 (18.0)	16 (21.3)	0.598 (OR 0.81, CI 0.40 − 1.71)	1 (6.7)	1 (3.3)	11 (19.0)	18 (26.1)	0.051
mRS 6	94 (38.1)	51 (29.7)	43 (57.3)	< 0.0001 (OR 0.32, CI 0.17-0.57)	2 (13.3)	7 (23.3)	17 (29.3)	25 (36.2)	0.0004
Futile recanalization (No. (%))§	124 (54.9)	73 (45.9)	51 (76.1)	< 0.0001 (OR 0.27, CI 0.13-0.53)	2 (15.4)	6 (23.1)	25 (46.3)	40 (60.6)	< 0.0001

Abbreviations: PT = procedure time; mTICI = modified treatment in cerebral infarction; FPE = first-pass effect; mRS = Modified Rankin Scale score.
*Comparison of < 80 vs. ≥ 80.
†Comparison of 18-49 vs. 50-59 vs. 60-69 vs. 70-79 vs. ≥ 80.
‡Seventeen missing values.
§Fourteen missing values.

presented as medians with interquartile range (IQR). For correlation analyses between continuous variables, we conducted Kendall's rank correlation. Weak, moderate and strong correlation was defined as r = 0.1 - 0.3, r = 0.3 - 0.5 and r > 0.5, according to Cohen (1988). To investigate the relationship between our age groups and categorical variables (sex, site of occlusion, IVT, RF, TOAST, mTICI, FPE and mRS), we generated contingency tables and performed Fisher's exact tests and pairwise Fisher tests, with corrections for multiple testing using the Holm-Bonferroni method. Results are reported as absolute and relative frequencies and odds ratios (OR) with their 95% confidence interval (CI). To determine the association of age and clinical outcome, we performed binary logistic regression analyses with age as the predictor for each of the prespecified mRS categories. Linearity of the logit was controlled by running logistic regression with the interaction term of age and its logit and influential observations were determined with Cook's D. We used omnibus tests (chi-square tests) to verify significance of the logistic regression models and Cohen's f^2 to estimate the effect size of the calculated Nagelkerke R^2. According to Cohen (1988), we defined $f^2 = 0.02$, $f^2 = 0.15$ and $f^2 = 0.35$ as small, medium and large effect sizes. Results of logistic regression analyses are presented as changes in odds, as OR and as average marginal effects (AME).

Statistical significance of our results was determined by a two-sided p-value < 0.05.

Results

Altogether, 264 individual patients were eligible for analyses. All baseline characteristics according to the predefined age groups are shown in Table 1. Age of the total sample ranged from 24 to 96 years and the median age was 72 years (IQR 63-81). 143 (54.2%) of patients were male, 121 (45.8%) were female. Our age groups were comparable regarding NIHSS at admission, time of last-seen-well-to-groin-puncture, site of occlusion and rates of IVT. There were significantly more male patients in the < 80 group than in the ≥ 80 group (59% vs. 43%, p = 0.022), while sex was more evenly distributed across the five predefined age groups (p = 0.081). We identified risk factors in 232 patients (87.9%). Groups differed significantly in rates of hypertension and atrial fibrillation with both being more present in older patient groups. Smoking, on the contrary, was more frequently observed in younger patients. Stroke aetiology remained unclear in 76 cases (28.8%). In the overall sample, cardioembolic stroke (TOAST 2) was the most frequent aetiology and accounted for 38.6% of analyzed cases. Rates of cardioembolic stroke were significantly higher in patients ≥ 80 than < 80 (57% vs. 34.1%, p = 0.0006), whereas stroke of other determined aetiology (TOAST 4) was significantly more frequent in younger age groups. Large artery atherosclerosis was equally distributed across all age groups.

Procedure time

Procedure time ranged from 10 to 240 min in the total sample, median time was 67min (IQR 40-112). PTs of all age groups are displayed in Table 2. There was no statistically significant difference in procedure times between groups < 80 and ≥ 80 years (65 vs. 76 min, p = 0.955). Similarly, we found no significant difference comparing PTs of the five age groups (p = 0.445, Fig. 1). Age was not significantly correlated with procedure time (Kendall's tau coefficient = 0.03, p = 0.459).

Rates of successful recanalization

Altogether, in 240 patients (90.9%) an mTICI score of ≥ 2b was achieved. No significant difference in rates of successful recanalization was found between < 80 and ≥ 80 years (91.9% vs. 88.6%, p = 0.483), nor between the five age groups (p = 0.490), as shown in Table 2 and Fig. 2. Also, first-pass effects were not significantly different between both analyzed sets of groups (Table 2).

Clinical outcome

We removed 17 patients (6%) who had been lost to follow-up. Of the remaining 247 patients, 42.9% reached mRS ≤ 2, 19.0% reached mRS 3-5 and 38.1% were dead three months after MT (Table 2). Of all patients alive at follow-up, 69.3% were functionally independent.

Outcome analysis of different age groups

There was a significant association of age and mRS three months after MT: The < 80 group showed significantly higher rates of mRS ≤ 2 (OR 4.02, [95% CI 2.09-8.11], p < 0.0001) and significantly lower rates of mRS 6 (OR 0.32, [95% CI 0.17-0.57], p < 0.0001) compared to the ≥ 80 group (Fig. 2). These differences in outcome remained in patients with successful recanalization after MT: 45.9 % of patients < 80 vs. 76.1 % of patients ≥ 80 achieved unfavourable outcome despite mTICI ≥ 2b (OR 0.27, [95% CI 0.13−0.53], p < 0.0001). No significant difference in mRS 3-5 between the < 80 and ≥ 80 group was found (OR 0.81, [95% CI 0.40-1.71], p = 0.598), but among patients alive at follow-up, the ≥ 80 group showed significantly higher rates of mRS 3-5 compared to the < 80 group (50% vs. 25.6%, p= 0.029).

Table 2 and Fig. 3 show the distribution of mRS scores by age groups and corresponding OR and p-values. We found that rates of mRS ≤ 2 (p < 0.0001) and mRS 6 (p = 0.0004) differed significantly between the five age groups. Odds of mRS ≤ 2 tended to progressively decrease from youngest to oldest group, whereas odds of mRS 6 increased from youngest to oldest group. In addition, rates of futile recanalization were also significantly higher in older groups (p < 0.0001, Table 2). Proportions of mRS 3-5 were just not significantly different between groups (p = 0.051). But again, focusing on patients alive

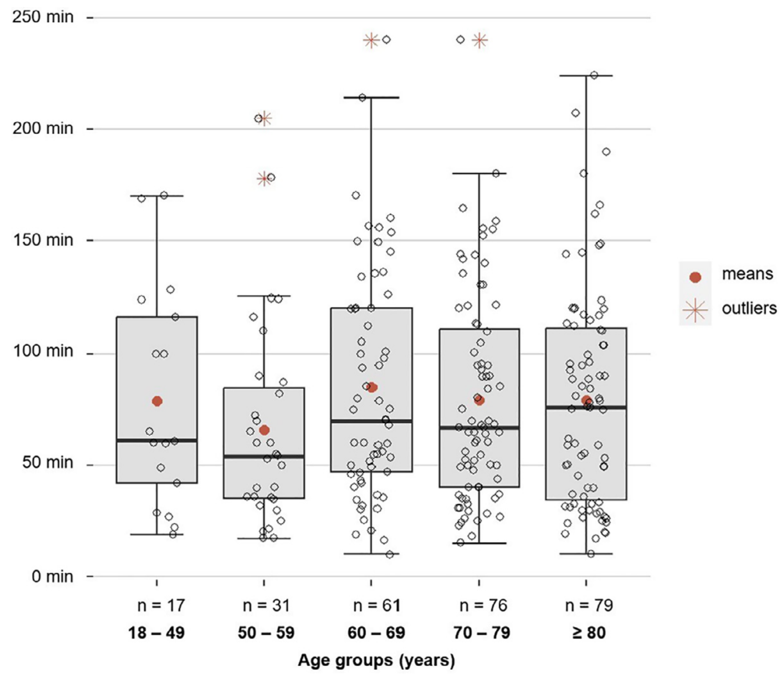

Fig. 1. *Boxplot showing procedure time characteristics for each age group. n = sample size.*

by three months after MT, odds of mRS 3-5 increased stepwise from the 50 - 59 group to the ≥ 80 group, indicating a higher degree of disability in older patients.

Analysis with age as the predictor for outcome

Age, as a continuous variable, was a significant predictor for each of the predefined mRS categories in our logistic regression models (Fig. 4): With every 1-year increase in age, odds of mRS ≤ 2 at three months follow-up decreased by factor 0.07/7% (95% CI 0.90 − 0.95), odds of mRS 3-5 increased by 1.04/4% (95% CI 1.01-1.07) and odds of mRS 6 increased by 1.06/6% (95% CI 1.04 − 1.09).

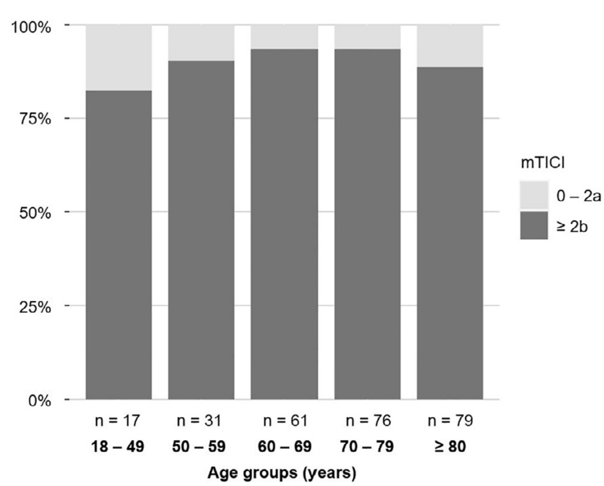

Fig. 2. *Barplot showing rates of mTICI ≥ 2b in each age group. 100% corresponds to the total number of patients per group. n = sample size.*

The effect of age on the likelihood of mRS ≤ 2 (Cohen's $f^2 = 0.30$) and mRS 6 (Cohen's $f^2 = 0.17$) was medium, the effect of age on the likelihood of mRS 3-5 (Cohen's $f^2 = 0.05$) was small. Average marginal effects of mRS 0-2, mRS 3-5 and mRS 6 were -1.5, 0.5 and 1.22 percentage points respectively.

Discussion

In this study, we showed that age did not affect procedure times of MT or rates of successful recanalization. However, higher age was clearly associated with lower functional independence, more disability and higher mortality at three months after MT.

Procedure time and rates of successful recanalization

Older patients showing comparable PT and RR was somewhat surprising. Elongation, tortuosity and increased atherosclerosis of the supraaortic arteries are more common in older patients and make catheter access more difficult, which generally results in longer PT and lower RR.[6,18,19] In addition, histological thrombus composition might play a role. It has been shown that clots of cardioembolic origin may present stiffer mechanical properties and are thus more difficult to remove[18,20–22]; at the same time, cardioembolic strokes are more often present in the elderly population.[23] Taken together, these facts may predict longer procedural times and lower recanalization rates in the elderly. Besides, low collateral status and arterial hypertension, which both are more prevalent in older patients,[4] increase the force needed to retrieve a

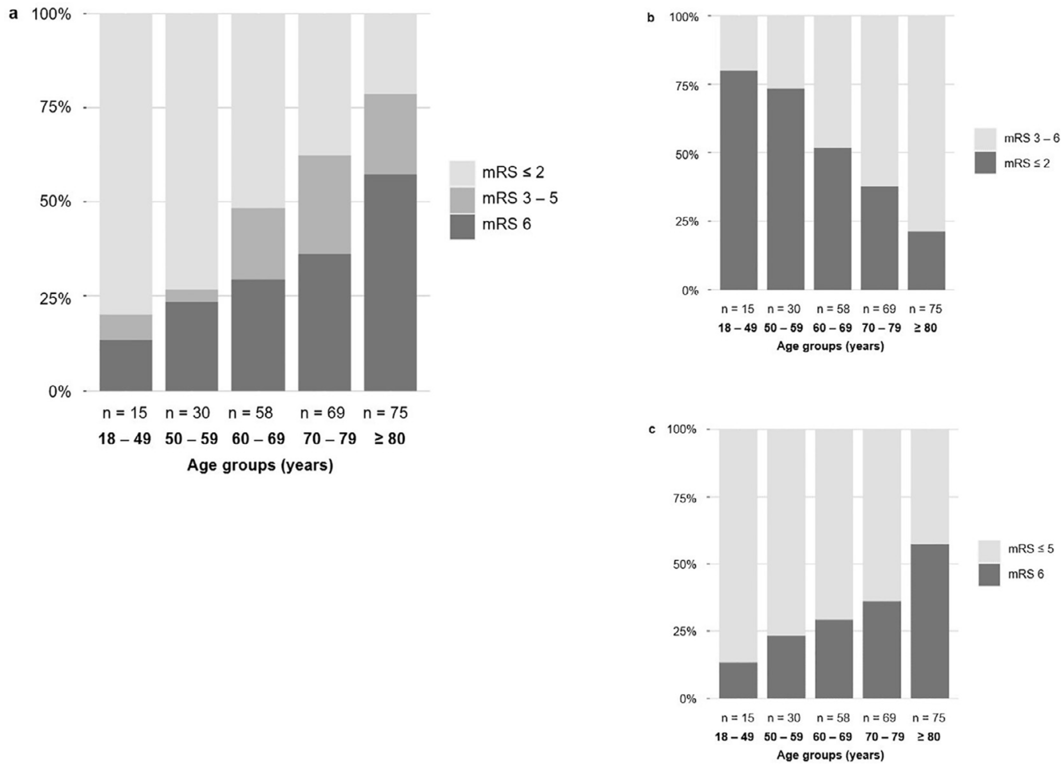

Fig. 3. *Barplots showing (**a**) the distribution of mRS scores, (**b**) rates of mRS ≤ 2 and (**c**) rates of mRS 6 in each age group at 3 months follow-up. n = sample size.*

clot. This might also lead to longer PTs and lower mTICI scores.[18,24]

The majority of studies addressing age-related MT-performance have dichotomized age groups to above and below 80 or 50 years. These studies reported inconsistent findings with some also reporting no significant differences in both variables[5,9,10] and others reporting longer PT or lower RR in the older group.[7,25] We identified one single study that also compared recanalization rates between multiple age categories. Singer et. al. (2013) studied differences between age groups $18 - 56$, $57 - 68$, $69 - 76$ and $77 - 94$ and found lower RR in the older groups.[26] However, multimodal recanalization techniques were applied and only occlusions of the proximal MCA and tandem occlusions were included. Hence, to our knowledge, this is the first study to compare PT and RR between multiple age groups of patients, that all have been treated with MT.

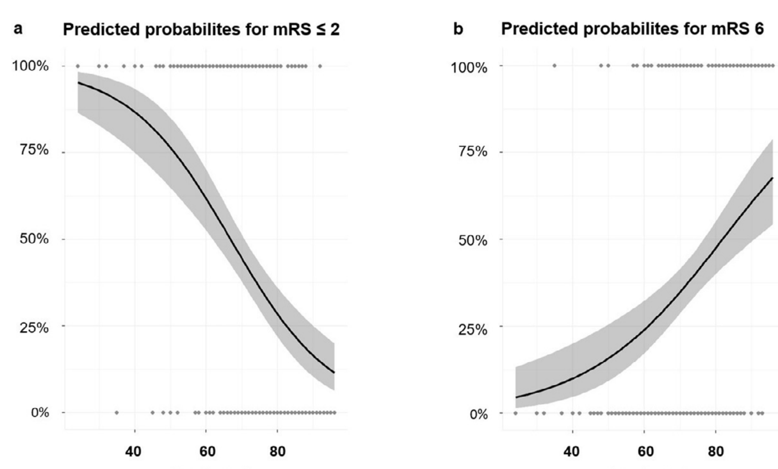

Fig. 4. *Plots of binary logistic regression models showing predicted probabilities of (**a**) mRS ≤ 2 and (**b**) mRS 6 at 3 months follow-up with age as a continuous variable. Gray areas correspond to the 90% confidence interval.*

One possible explanation for similar PT and RR despite mentioned factors may lie in the continuous development of more effective thrombectomy devices and techniques, as well as in the increasing experience of interventionalists. Over the past years, these factors have led to substantially shorter procedure times, fewer device passes till recanalization and higher recanalization rates in general.[18,27] This might have contributed to faster and more successful reperfusion also in older, more complex patients and possibly led to smaller differences in MT performance between younger and older populations.

Clinical outcome

Longer procedure times and lower recanalization rates have been clearly associated with worse clinical outcome.[7,11,12,24,28] However, in our series outcomes three months after MT were worse in older patients despite comparable PT and RR in different age groups (Table 2, Fig. 2). The ≥ 80 group showed significantly lower rates of functional independence and higher mortality rates compared to the < 80 group, which is consistent with prior findings.[9,10,29] Moreover, we found odds of favorable outcome not only to differ between groups of < 80 and ≥ 80 years but to actually start to decrease stepwise from the 5th decade on (Table 2, Fig. 3). In contrast, mortality rates increased from youngest (13.3 %) to oldest (57.3 %) group.

Similar to our study, Söderqvist et.al. (2016) divided patients into groups of 16 - 49, 50 - 64, 65 - 79 and 80 - 91 and also observed lower proportions of mRS ≤ 2 in older groups, while they did not mention differences in mortality, care dependency, procedure times or recanalization rates.[30] Roland et.al. (2019) mainly explored differences in outcomes of working ages (18 - 64) vs. the elderly (≥ 65 years) and similarly reported worse outcomes in the older group. Secondary subgroup analyses of groups 18 - 49, 50 - 64, 65 - 80 and ≥ 81 showed higher odds of death and lower odds of functional independence in older groups.[2] Patient selection in both studies was similar to our own, except that they only included occlusions of the anterior circulation.

Despite these age-related differences in clinical outcome, MT is a safe and effective therapy for AIS of LVO also in the elderly. The HERMES study demonstrated better outcomes of patients treated with MT vs. standard medical care at three months follow-up and revealed that older patient populations benefit even more from MT than younger patients.[1]

One explanation for higher rates of disability, mortality and futile recanalization in older patients after MT could be the more frequent cardiovascular risk factors and comorbidities. We showed significantly higher rates of hypertension and atrial fibrillation and a tendency of more diabetes mellitus in older stroke patients, which is consistent with previous findings[2,5,31] and was positively correlated with worse outcome.[11,24,32] Some other factors, that have shown to be more prevalent in older patients and have been identified as possible predictors for worse outcome in previous studies, are female sex,[33] higher NIHSS at admission,[11,24] symptomatic intracranial haemorrhage after MT,[33] poststroke complications and reduced capacity for neurogenesis and neuroplasticity. Overall, the clear effect of age on clinical outcome after MT emphasises the importance of better identification and deeper understanding of underlying causes to improve and adapt treatment for older stroke patients and achieve better outcomes after MT.

Limitations

Our study has some limitations. First, pre-stroke mRS scores of patients were inconsistently available due to incomplete medical records and have therefore not been included in our analysis. Furthermore, potential confounding factors, such as comorbidities and sex, were not analyzed in detail. The results were therefore not adjusted to these. Also, this is a single-centre study of observational character. In addition, sample sizes of the younger age groups were rather small. Lastly, we conducted multiple statistical tests on our patient sample, which increases type 1 error. However, our analyses of the primary and secondary outcomes were either clearly not significant without correction for multiplicity or were significant at an α level of < 0.0001 (except for mRS 6 across the five age groups with a p-value of 0.0004)."

Conclusion

Age had no significant impact on procedure times or rates of successful recanalization in our patient population. Nevertheless, age was a significant predictor for clinical outcome three months after MT. From the youngest (18 - 49 years) to the oldest (≥ 80 years) subgroup, rates of functional independence decreased and mortality rates increased gradually.

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Data sharing

Data are available on request from the corresponding author.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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