THE NEW ARMENIAN MEDICAL JOURNAL
Volume16 (2022), Issue 4 p.102-106

DOI: https://doi.org/10.56936/18290825-2022.16.4-102

CLINICAL OUTCOMES OF REPERFUSION THERAPIES IN ELDERLY PATIENTS WITH ACUTE ISCHEMIC STROKE

Sahakyan G.G. [1,2]*, Orduyan M.H. [2], Babayan A.G. [2], Manvelyan H.M.[1,2]

[1]Department of Neurology, Yerevan State Medical University, Yerevan, Armenia
[2]Astghik Medical Center, Yerevan, Armenia

Received 26.05.2022; accepted for printing 18.08.2022

Abstract

Stroke remains the major cause of disability and mortality worldwide. The incidence of ischemic stroke increases with age and is particularly high in people aged ≥80 years. This study aimed to evaluate the efficacy and safety of reperfusion therapies (intravenous thrombolysis, endovascular thrombectomy, intravenous thrombolysis+ endovascular thrombectomy) in acute ischemic stroke patients aged over 80 years in one of the largest comprehensive stroke centers in Armenia. The study was based on retrospective analyses of prospectively gathered data from all stroke patients of Astghik medical center benefiting reperfusion therapies from 1 February 2021 to 30 April 2022. The safety was evaluated by assessing in-hospital complications and in-hospital and 3-months mortality rates. The efficacy was defined as neurological improvement at discharge and a modified Rankin scale 0-2 (or a return to at least the pre-stroke modified Rankin scale) at 3 months. A total of 216 patients with acute ischemic stroke were treated with reperfusion therapies. The number of patients aged 80 years or over was 41(18,9%). The study group had a mortality rate of 9,7% in an in-hospital setting and 22% at 3 months. Symptomatic intracranial hemorrhage was detected in 3 cases (7.3%). None of the patients developed aspiration pneumonia. 32 patients (78%) had neurological improvement at discharge and 21 patients (51%) were independent or regained pre-stroke activities at 3 months. Based on our results we support the wider application of reperfusion therapies in this age group to reduce disability and improve post-stroke outcomes.

Keywords: *reperfusion therapy, stroke, elderly, Armenia.*

Introduction

Stroke remains the major cause of disability and mortality worldwide [*Johnson C et al, 2016*]. Estimates from the world stroke organization confirm that globally, over 62% of all incident strokes are ischemic strokes [*Feigin V et al, 2022*]. The incidence of ischemic stroke increases with age and is particularly high in people aged ≥80 years [*Rosamond W et al*, 2008]. Nowadays, intravenous thrombolysis and endovascular thrombectomy are the only approved treatments for acute ischemic stroke aiming to restore the blood flow to the salvageable ischemic brain tissue that is not yet infracted. Meanwhile, the vast majority of randomized clinical trials exploring the efficacy and safety of reperfusion therapies have not included subjects ≥80 years of age, thus reducing information for proper therapeutic management for this group of patients [*Hacke W et al, 2004*]. In clinical practice older patients are

Cite This Article as:
*Sahakyan G.G., Orduyan M.H., Babayan A.G., Manvelyan H.M.(2022).*Clinical Outcomes of Reperfusion Therapies in Elderly Patients with Acute Ischemic Stroke. The New Armenian Medical Journal, 16(4): 102-106, https://doi.org/10.56936/18290825-2022.16.4-102

Address for Correspondence:
Greta G Sahakyan
Yerevan State Medical University, Yerevan, Armenia
2 Koryun Street, Yerevan 0025, Armenia
Tel.:(+37477) 50 71 10
E-mail: drgretasahakyan@gmail.com

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY

treated less aggressively than younger subjects, probably because they may have a higher risk of complications and mortality rates. However, more and more data support that patients from this age group may still benefit from reperfusion therapies, and age alone should not be a reason to exclude patients from these treatments [*Mishra NK et al, 2010; Emberson J et al., 2014; Jayaraman MV, McTaggart RA, 2018; Hilditch CA et al, 2018*].

Reperfusion therapies in Armenia was implemented starting in February 2019 as a part of Armenian national stroke program launched and funded by the government, aiming to improve the existing stroke care model. Current guidelines in Armenia recommend the use of intravenous thrombolysis on an individual benefit-risk basis in patients over 80 years of age and, endovascular thrombectomy in patients with preserved pre-stroke autonomy without age restriction.

This study aimed to evaluate the efficacy and safety of reperfusion therapies (intravenous thrombolysis, endovascular thrombectomy, intravenous thrombolysis + endovascular thrombectomy) in acute ischemic stroke patients aged over 80 years in Astghik medical center, one of the largest comprehensive stroke centers in Armenia. Our stroke center joined the national stroke program in February of 2021 and since then is providing around 30% of all reperfusion therapies in the country based on reports from the ministry of health.

Material and methods

The study was based on retrospective analyses of prospectively gathered data from all stroke patients of Astghik medical center benefiting reperfusion therapies from 1 February 2021 to 30 April 2022. We included patients aged 80 years or over. The following data such as gender, comorbidities, stroke onset time at arrival, American National Institutes of Health Stroke Scale (NIHSS) at admission and discharge, type of reperfusion procedure, pre-stroke modified Rankin scale (mRS), in-hospital complications, and hospital length of stay were collected. The Trial of Org 101072 in Acute Stroke Treatment (TOAST) classification was used to assess the etiology of stroke [*Adams HP et al, 1993*]. The indication and type of reperfusion therapies (intravenous thrombolysis, endovascular thrombectomy, intravenous thrombolysis +endovascular thrombectomy) were selected according to the Armenian national acute stroke guidelines. The therapeutic decision was made by the stroke team neurologist based on clinical, radiological, and in some cases laboratory examinations, following a specialized stroke checklist with clearly defined eligibility criteria. The safety of reperfusion therapies was evaluated by assessing in-hospital complications and in-hospital and 3 months mortality rates. The efficacy of reperfusion therapies was defined as neurological improvement at discharge (a drop of National Institutes of Health Stroke Scale more than 4 points) and mRS 0-2 (or a return to at least the pre-stroke mRS) at 3 months.

The mRS at 3 months was assessed by a stroke team neurologist during a follow-up consultation or by telephone from patients or their family members. The analyses were performed using IBM-SPSS statistics.

Results

A total of 216 patients with acute ischemic stroke were treated with reperfusion therapies between 1 February 2021 and 30 April 2022. The median age of the total population was 71, (IQR 64-79). The number of patients aged 80 years or over was 41(18,9%). The median stroke onset time at arrival was 150min., (IQR110-220), the median National Institutes of Health Stroke Scale at admission was 11(IQR 8-17). The most common comorbidities were hypertension (75.6%) and atrial fibrillation (39%). The results of the baseline characteristics and the clinical outcoms of the study group are presented in table 1 and table 2.

Our study group had a mortality rate of 9,7% in an in-hospital setting and 22% at 3 months.

Symptomatic intracranial hemorrhage (SICH) was detected in 3 cases (7.3%), and none of the patients developed aspiration pneumonia during the hospital stay. 32 patients (78%) had neurological improvement at discharge and 21 patients (51%) were independent or regained pre-stroke activities at 3 months (mRS 0-2).

To overcome it is possible, due to the uniting the knowledge and will of all doctors in the world

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY

TABLE 1

Summarizes the baseline characteristics of the study group.

Baseline characteristics of patients n = 41		
Age (Median, IQR)		84 (82- 85)
Hospital length of stay (Median, IQR)		3 (3-8.5)
Stroke onset min. (Median, IQR)		150 (110-220)
National Institutes of Health Stroke Scale admission (Median, IQR)		11 (8-17)
Pre-stroke mRS		1 (0-2)
Gende		
Female	n=25	61%
Male	n=16	39%
Presence of comorbidity	n=38	92%
Presence of multimorbidity	n=24	58.8%
Hypertension	n=31	75.6%
Diabetes type 2	n=3	7.3%
Coronary heart disease	n=13	32%
Heart failure	n=5	12.2%
Atrial fibrillation	n=16	39.0%
Valvular heart disease	n=3	7.3%
COVID-19 infection	n=2	4.9%
Intravenous thrombolysis	n=23	56.1%
Intravenous thrombolysis +endovascular thrombectomy	n=7	17.07%
endovascular thrombectomy	n=10	24.3%
Intravenous thrombolysis + cerebralangiography	n=1	2.4 %
Trial of Org 101072 in Acute Stroke Treatment (TOAST)		
Cardioembolism	n=17	41.5%
Two or more cases identified	n=12	29.3%
Small-vessel occlusion	n=3	7.3%
Large artery atherosclerosis	n=5	12.2%
Other determined etiology	n=1	2.4%
Incomplete evaluation	n=2	4.9%
Negative evaluation	n=1	2.4%

TABLE 2

Summarizes the data on clinical outcomes.

Baseline characteristics of patients	n=41	
National Institutes of Health Stroke Scale discharge (Median, IQR)		2(0-6)
Neurological improvement at discharge	n=32	78%
In-hospital mortality	n=4	9.7%
In-hospital complications	n=3	7.3%
Symptomatic brain hemorrhage	n=3	7.3%
Aspiration pneumonia	n= 0	0%
3-month mortality rate	n=9	22%
mRS 0-2	n=21	51%
mRS 3-5	n=5	12%
Lost of follow up	n=2	4.8%

DISCUSSION

Acute stroke care approach in the elderly population remains controversial based on literature reviews and routine clinical practice scenarios. Different studies show that patients over 80 years have an increased risk of unfavorable outcomes and higher mortality rates when compared to their younger counterparts. However, based on the outcome these studies support the safety and feasibility of reperfusion therapies in patients over 80 years of age [*Willey JZ et al, 2012; Heja M et al, 2021*; *Sudre J et al, 2021*; *Viticchi G et al, 2022*].

The aging society puts a heavy burden on healthcare, not sparing stroke care either, especially in countries with limited financial resources **[***Pandian JD et al, 2020*; *De Souza AC et al, 2022*]. Armenia is an upper-middle-income country and its population is aging [*World Bank, 2022*]. In this low resource context it becomes obvious that the appropriate selection of patients for reperfusion therapies is essential to allow optimization of funding. The challenge in clinical decision-making in elderly patients is to identify the possible predictors of non-favorable outcomes, to improve patient selection, therapeutic strategies, and resource utilization. Thus, future studies are required to evaluate the factors associated with mortality or poor outcome in this age group, as well as the association of dedicated stroke unit care and stroke logistics on functional outcomes in different age groups.

Based on a recent systematic review, in a low resource setting, in addition to RT, simple interventions such as swallowing assessments, bowel and bladder care, mobility assessments and consistent secondary prevention can prove to be key elements to improving post-discharge morbidity and mortality. [*Pandian JD et al, 2017*].

Our results showed that none of our patients in the study group developed aspiration pneumonia during their hospital stay, thus highlighting the positive effect of the performance of early swallowing assessment in our stroke center. The early activation and rehabilitation after 24 hours from reperfusion therapies enabled the reduction in the median hospital length of stay. Non-reported data shows that before the implementation of dedi-

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY

cated stroke unit care the median hospital length of stay was 10 days for the same-age patients, mainly related to secondary poststroke complications. The next important point in this study mentions that the median stroke onset time at arrival was 150 min. which, for sure, is a major predictor of a favorable outcome after reperfusion therapies regardless of the age of patients.

The main limitation of our study was missing data about same-age patients who were within the therapeutic window for reperfusion therapies but were not selected by stroke team neurologists due to contraindications or individual ineligibility assessment.

Our study group had an all-cause 3 months mortality rate of 22%, despite 78% of neurological improvement seen at discharge. Further studies need to evaluate the role of the current systems of post-stroke care, socio-economic conditions, and family support on functional outcomes and mortality rates for this age group.

Conclusion

The Stroke Departments establishment in Armenia plays paramount role in improvement of both survival and outcomes in stroke patients of all ages.

Although elderly population and old olds are most vulnerable in the case of cerebro-vascular events, our findings suggest that reperfusion therapies among acute ischemic stroke patients ≥ 80 years appears to be safe and increases the likelihood of functional independence at 3 months after stroke, regardless of stroke severity, and baseline comorbidities.

So according our clinical experience and multicentral international data effective treatment of patients with acute stroke depends on in-time diagnostics and treatment, the age of patients must be considered only within comorbidity.

Based on our results we support the wider application of reperfusion therapies in this age group to reduce disability and improve post-stroke outcomes.

REFERENCES

1. *Adams HP; Bendixen BH; Kappelle LJ; Biller J; Love BB; Gordon DL; et al,* (1993) Classification of Subtype of Acute Ischemic Stroke https://www.ahajournals.org/doi/pdf/10.1161/01.STR.24.1.35
2. *De Souza AC, Sebastian IA, Zaidi WAW, Nasreldein A, Bazadona D, Amaya P, et al*. (2022) Regional and national differences in stroke thrombolysis use and disparities in pricing, treatment availability, and coverage. International Journal of Stroke. 2022;17(9):990-996. doi:10.1177/17474930221082446
3. *Emberson J, Lees KR, Lyden P, Blackwell L, Albers G, Bluhmki G et al*. (2014) Effect of treatment delay, age, and stroke severity on the effects of intravenous thrombolysis with alteplase for acute ischaemic stroke: a meta-analysis of individual patient data from randomised trials. Lancet. 2014; 384:1929-1935.
4. *Feigin V, Brainin M , Norrving B , Martins S, Sacco R , Hacke W, et al.* (2022)
5. *Hacke W, Donnan G, Fieschi C, Kaste M, Kummer R, Broderick J, et al.* (2004) Association of outcome with early stroke treatment: pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke trials. Lancet.;363: 768-774.
6. *Heja M, Fekete I, Horvath L, Marton S, Fekete K.* (2021) ExperiencesWith Intravenous Thrombolysis in Acute Ischemic Stroke by Elderly Patients–A "Real World Scenario"(2021) Frontiers in Neurology,art. no. 721337 https://www.frontiersin.org/articles/10.3389/fneur.2021.721337/full#B1
7. *Hilditch CA, Nicholson P, Murad M, Rabinstein A, Schaafsma J, Pikula A, et al.* (2018) Endovascular management of acute stroke in the elderly: a systematic review and meta-analysis. Am J Neuroradiol. 2018;39(5):887-891.
8. *Jayaraman MV, McTaggart RA. (2018)* Endovascular treatment of anterior circulation large vessel occlusion in the elderly. Front Neurol. 2018;8:713. https://doi.org/10.3389/fneur.2017.00713
9. *Johnson C, Nguyen M, Roth G, Nichols E, Alam T, Abate D,* ***et al.*** (2019) 1990-2016: Global, regional, and national burden of stroke, a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. (2019). 18:439–58. doi: 10.1016/S1474-4422(19)30034-1

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY

10. *Mishra NK, Ahmed N, Andersen G, Edigo J, Lindsberg P, Ringleb P, et al*. (2010) Thrombolysis in very elderly people: controlled comparison of SITS International Stroke Thrombolysis Registry and Virtual International Stroke Trials Archive. BMJ. 2010;341:c6046.

11. *Pandian JD, Kalkonde Y; Sebastian I; Felix C; Urimubenshi G, Bosch* J (2020). Stroke systems of care in low-income and middle-income countries: challenges and opportunities. The Lancet. 396. 1443-1451. 10.1016/S0140-6736(20)31374-X.

12. *Pandian JD, William AG, Kate MP, Norrving B, Mensah GA, Davis S, et al (2017)* Strategies to Improve Stroke Care Services in Low- and Middle-Income Countries: A Systematic Review. Neuroepidemiology. 2017;49(1-2):45-61. doi: 10.1159/000479518. Epub 2017 Aug 19. PMID: 28848165.

13. *Rosamond W, Flegal K, Furie K, Go A, Greenlund K, HaaseN , et al.* (2008) Heart disease and stroke statistics—2008 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation. 2008; 29;117(4):e25-146. doi: 10.1161/CIRCULATIONAHA.107.187998.

14. *Sudre J, Venditti L, Ancelet C, Chassin O, Sarov M, Smadja D, et al,* (2021). Reperfusion therapy for acute ischemic stroke in older people: An observational real□life study. Journal of the American Geriatrics Society. Volume69, Issue11, 3167-3176, PMID: 34374987 DOI: 10.1111/jgs.17394

15. *Viticchi G, Potente E, Falsetti L, Burattini M, Bartoloni M, Buratti L, et al.* (2022) Efficacy and safety of reperfusion treatments in middle-old and oldest-old stroke patients. NeurolSci 43, 4323–4333 (2022). https://doi.org/10.1007/s10072-022-05958-4

16. *illey JZ; Ortega-Gutierrez S; Petersen N; Khatri P; Ford AL; Rost NS; et al* (2012) Impact of Acute Ischemic Stroke Treatment in Patients >80 Years of Age. Stroke. 2012;43:2369–2375 https://doi.org/10.1161/STROKEAHA.112.660993

17. World Bank.2022 Population ages 65 and above, total – Armenia|Data, https://data.worldbank.org/indicator/SP.POP.65UP.TO?locations=AM 2022

18. WSO global stroke fact sheet https://world-stroke-academy.org/media/uploads/2022/02/World-Stroke-Organization-WSO-Global-Stroke-Fact-Sheet-2022.pdf

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY

THE NEW ARMENIAN MEDICAL JOURNAL
Volume16 (2022). Issue 4

CONTENTS

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY

THE NEW ARMENIAN MEDICAL JOURNAL

Volume16 (2022). Issue 4

The Journal is founded by
Yerevan State Medical
University after M. Heratsi.

Rector of YSMU

Armen A. Muradyan

Address for correspondence:

Yerevan State Medical University
2 Koryun Street, Yerevan 0025,
Republic of Armenia

Phones:

(+37410) 582532 YSMU
(+37493 588697 Editor-in-Chief
Fax: (+37410) 582532
E-mail: namj.ysmu@gmail.com, ysmiu@mail.ru
URL: http//www.ysmu.am

Our journal is registered in the databases of Scopus, EBSCO and Thomson Reuters (in the registration process)

SCOPUS EBSCO REUTERS

Copy editor: Tatevik R. Movsisyan

Printed in "VARM" LLC
Director: Ruzanna Arakelyan
Armenia, 0018, Yerevan,
Tigran Mec 48, 43
Phone: (+374 91) 19 29 00,
E-mail: armana6@mail.ru

Editor-in-Chief

Arto V. **Zilfyan** (Yerevan, Armenia)

Deputy Editors

Hovhannes M. **Manvelyan** (Yerevan, Armenia)
Hamayak S. **Sisakyan** (Yerevan, Armenia)

Executive Secretary

Stepan **A. Avagyan** (Yerevan, Armenia)

Editorial Board

Armen A. **Muradyan** (Yerevan, Armenia)
Drastamat N. **Khudaverdyan** (Yerevan, Armenia)
Levon M. **Mkrtchyan** (Yerevan, Armenia)

Foregin Members of the Editorial Board

Carsten N. **Gutt** (Memmingen, Germay)
Muhammad **Miftahussurur** (Indonesia)
Alexander **Woodman** (Dharhan, Saudi Arabia)
Hesam Adin **Atashi** (Tehran, Iran)

Coordinating Editor (for this number)

Drastamat N. **Khudaverdyan** (Yerevan, Armenia)

Editorial Advisory Council

Ara S. **Babloyan** (Yerevan, Armenia)
Aram **Chobanian** (Boston, USA)
Luciana **Dini** (Lecce, Italy)
Azat A. **Engibaryan** (Yerevan, Armenia)
Ruben V. **Fanarjyan** (Yerevan, Armenia)
Gerasimos **Filippatos** (Athens, Greece)
Gabriele **Fragasso** (Milan, Italy)
Samvel G. **Galstyan** (Yerevan, Armenia)
Arthur A. **Grigorian** (Macon, Georgia, USA)
Armen Dz. **Hambardzumyan** (Yerevan, Armenia)
Seyran P. **Kocharyan** (Yerevan, Armenia)
Aleksandr S. **Malayan** (Yerevan, Armenia)
Mikhail Z. **Narimanyan** (Yerevan, Armenia)
Levon N. **Nazarian** (Philadelphia, USA)
Yumei **Niu** (Harbin, China)
Linda F. **Noble-Haeusslein** (San Francisco, USA)
Arthur K. **Shukuryan** (Yerevan, Armenia)
Suren A. **Stepanyan** (Yerevan, Armenia)
Gevorg N. **Tamamyan** (Yerevan, Armenia)
Hakob V. **Topchyan** (Yerevan, Armenia)
Alexander **Tsiskaridze** (Tbilisi, Georgia)
Konstantin B. **Yenkoya**n (Yerevan, Armenia)
Peijun **Wang** (Harbin, Chine)

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY