Research Article

Short-Term Outcome Assessment of Acute Ischemic Stroke After Intravenous Fibrinolytic Therapy: A Cross-sectional Study

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Abstract

Background: The disease burden of acute ischemic stroke (AIS) is an important health issue in today's patient care. Urgent intravenous thrombolytic (UIT) therapy is one of the most popular treatments in these cases.

Objectives: This study aimed to evaluate the 1-month outcome of patients with AIS who received urgent intravenous fibrinolytic therapy.

Methods: In a prospective cross-sectional study, we evaluated the 1-month outcome of cases with a confirmed diagnosis of AIS who had received UIT therapy at the emergency department. Demographic data, mortality and morbidity, hospital length of stay, admission functional disability by Modified Rankin Scale (MRS), National Institutes of Health Stroke Scale (NIHSS), and final disposition of patients were all evaluated and recorded via their medical records or structured telephone inquiries. We compared all variables between the 2 groups (i.e., survived and expired groups).

Results: Among 490 cases we assessed, age had a mean $\pm$ SD of 69.41 $\pm$ 12.25 years, and most cases were males (74.3%). The 1-month mortality rate in our sample was 4.08% (20 cases). The mean $\pm$ SD of hospital length of stay was 6.84 $\pm$ 7.32 days, with no significant difference between the 2 groups (P = 0.869). Demographic data showed no significant differences between the 2 groups. NIHSS and MRS scores were significantly higher in the expired group than in the survived group (P = 0.005 and P = 0.001, respectively).

Conclusions: NIHSS and MRS scores were significantly higher in the expired cases. The 1-month mortality rate in this study was 4.08%.

Keywords: Ischemic Stroke, Thrombolytic Therapy, Patient Outcome Assessment

1. Background

Stroke (with a reported mortality rate of 12%) is well known to be the third leading cause of death and the most common cause of disability around the world (1). The 1-month case fatality rate is estimated to range from 16% to 32% (2). In two-thirds of survivors, stroke's functional disabilities definitely affect their quality of life (3-5). Urgent intravenous thrombolysis (UIT) is accounted as an important treatment for clinical improvement in acute ischemic stroke (AIS) (6, 7).

Many studies have reported different controversial outcome rates in AIS after the administration of UIT. Shorter door-to-needle time, the absence of underlying diseases, milder stroke and smaller involved territory, younger age, and normoglycemia are considered among the most influential factors (2, 8). It is revealed that the age and functional status of the patient at discharge (9, 10) and stroke subtype (11) can be significant predictors of mortality.

Nowadays, UIT administration in appropriate patient populations has been motivated worldwide. In Iran, the reported incidence of ischemic stroke has been raised to approximately 100/100 000 population over the years (12, 13). After the initiation of the Telestroke activation service, the use of UIT has also increased in most stroke management centers. Most previous studies have assessed the long-term outcome of AIS cases. There is also little research performed in Iran evaluating the AIS outcome after UIT. Limited studies conclude the case fatality rate of ischemic stroke in Iran to be 14 - 26% (12-15).

2. Objectives

In this study, we decided to study the short-term outcome of these cases in a referral center.

3. Methods

In this prospective cross-sectional study, we enrolled patients with AIS diagnosis who had undergone UIT in the emergency department (ED) during a 2-year interval from 2018 to 2019 in Dr. Shariati Hospital (a tertiary referral center) in Tehran, Iran. The sampling method was enrolling all available cases. AIS diagnosis was based on the initial clinical presentations, brain computed tomography (CT), or brain magnetic resonance imaging (MRI) on the admission day in ED. Neurology specialists confirmed diagnosis, investigated for indications and contraindications to receive UIT, and finally determined the most appropriate candidates.

In Iran, an emergency medical service (if it is called) announces an ischemic stroke at the scene and activates a special coding system via the Telestroke activation service to the destination hospital. The patient is quickly transferred to a well-equipped hospital for stroke management.

The exclusion criteria were patient unwillingness to participate in our study, lack of access to his/her medical data, and lost to follow-up.

Demographic data, risk factors in past medical history (including the previous history of ischemic stroke), hospital length of stay, baseline vital signs and capillary blood sugar, admission functional disability by Modified Rankin Scale (MRS), admission National Institutes of Health Stroke Scale (NIHSS), final disposition of patients, and 1-month mortality rate were all recorded in a predesigned questionnaire. Study variables were evaluated during admission by frequent follow-up visits or phone contacts after discharge.

This study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.MEDICINE.REC.1399.049). Informed written consent was obtained from all participants to share their data.

3.1. Statistical Analysis

Data were analyzed using SPSS version 23 (SPSS Inc, Chicago, Ill, USA). We determined normality with the Kolmogorov-Smirnov test. Descriptive indices, such as frequency (percentage) and mean (SD), were used to express the results. The Fisher exact test, independent t test, or nonparametric test (Mann-Whitney U test) were used as required. Logistic regression was used to evaluate the association of variables with the final outcome. The level of significance was 0.05. We enrolled patients who met our inclusion criteria from 2018 to 2019.

4. Results

We evaluated 527 patients with AIS with UIT treatment in ED during 2018 - 2019. Thirty-seven patients met the ex-

clusion criteria; thus, we enrolled 490 cases. Most cases were males (74.3%), and the population's age had a mean $\pm$ SD of 69.41 $\pm$ 12.25 years old [with the most being older than 65 years old (78.9%)]. Most cases had major risk factors in their past medical histories (86.2%). Basic data in the study population are shown in Table 1.

Table 1. Basic Data of the Study General Population [a]

Variables	Values
Gender	
Male	364 (74.3)
Female	126 (25.7)
Age (y)	69.41 $\pm$ 12.25
Risk factors in past medical history	
Cardiovascular	147 (30.0)
Cerebrovascular	94 (19.2)
Hypertension	65 (13.3)
Hyperlipidemia	71 (14.5)
Diabetes mellitus	45 (9.1)
None	68 (13.9)
Hospital length of stay (day)	9.57 $\pm$ 7.63
Baseline vital signs	
Systolic blood pressure (mmHg)	167.53 $\pm$ 5.32
Diastolic blood pressure (mmHg)	96.70 $\pm$ 4.35
Heart rate (meats/min)	87.34 $\pm$ 3.21
Oxygen saturation (%)	92.46 $\pm$ 5.73
Capillary blood sugar (mg/dL)	168.36 $\pm$ 7.52
Modified Rankin scale	3.41 $\pm$ 1.93
National institutes of health stroke scale	7.47 $\pm$ 4.32
Final disposition of patients	
Survived	470 (95.92)
Expired	20 (4.08)
1-month mortality rate	20 (4.08)

[a] Values are expressed as No. (%) or mean $\pm$ SD.

The 1-month mortality rate in this study was 4.08%, and none of the cases expired during admission. After comparing studied variables in the expired and survived groups, we found that most variables had no statistically significant difference between the 2 groups, except for NIHSS and MRS scores (P = 0.005 and P = 0.001, respectively). Table 2 shows the main comparisons between all study variables between the 2 groups.

Logistic regression results revealed that the odds ratio (OR) of mortality for NIHSS > 10 was 1.198, and for MRS > 3 was 1.067 (Table 3).

Table 2. Comparison of the Variables Between the 2 Groups [a]

Variables	Expired Group	Survived Group	P Value
Gender			0.071
Male	14 (2.9)	350 (71.4)	
Female	6 (1.2)	120 (24.5)	
Age (y)	66.21 ± 13.45	72.90 ± 13.93	0.125
Risk factors in past medical history			
Cardiovascular	6 (1.2)	141 (28.8)	0.123
Cerebrovascular	1 (0.2)	93 (19.0)	0.226
Hypertension	4 (0.8)	61 (12.5)	0.014
Hyperlipidemia	5 (1.0)	66 (13.5)	0.118
Diabetes mellitus	2 (0.4)	43 (8.7)	0.221
None	2 (0.4)	66 (13.5)	0.436
Hospital length of stay (day)	5.61 ± 4.81	8.10 ± 1.87	0.869
Baseline vital signs			
Systolic blood pressure (mmHg)	143.65 ± 2.34	174.31 ± 3.62	0.153
Diastolic blood pressure (mmHg)	9.21 ± 2.67	10.65 ± 5.35	0.370
Heart rate (beats/min)	89.12 ± 7.31	91.31 ± 8.02	0.092
Oxygen saturation (%)	93.26 ± 6.24	95.19 ± 4.34	0.327
Capillary blood sugar (mg/dL)	152.48 ± 67.07	184.40 ± 72.88	0.078
National Institutes of Health Stroke Scale	5.45 ± 4.43	10.40 ± 5.58	0.005

[a] Values are expressed as No. (%) or mean ± SD.

Table 3. Logistic Regression Results

Variables	OR	95% CI	P Value
NIHSS score	1.198	1.069 - 1.343	0.002
MRS score	1.067	0.042 - 1.119	0.004

5. Discussion

In the present study, all evaluated AIS cases received UIT in ED. Most cases were males (74.3%) and older than 65 years old (78.9%). Past medical history was positive in the majority of cases, especially cardiovascular and cerebrovascular conditions (almost 50%). Chen et al (2013) evaluated both young and old age stroke cases (all types). In the > 65 years old group, the mean ± SD of age was 75.8 ± 7.1 years old. Most cases were males (50.6%) and had underlying diseases (16).

In our study, the hospital length of stay was 5.61 ± 4.81 days, the NIHSS score was 7.47 ± 4.32, and the MRS score was 3.41 ± 1.93. Chen et al. reported that the hospital stay in the acute ward was 19.4 ± 17.7 days. NIHSS in their studied elderly population was 6.0 ± 5.8 (16).

We observed a mortality rate of 4.08% in this study.

Some report in Iran indicates that the 28-day case fatality rate in all stroke types is around 19 - 31% (17). As investigated in Iran, stroke is slightly more common in females, and the mean age of stroke is within the seventh decade of life (12, 13). Hypertension is found to be the most common risk factor both in ischemic and nonischemic stroke (12, 13). The case fatality rate in ischemic stroke is reported to be 14 - 26% (12-15). Our study shows that by UIT treatment, we may be able to reduce this mortality.

Sari Aslani et al. evaluated 217 patients with AIS who had undergone UIT in a prospective study. The mean ± SD of age was 66.40 ± 13.37 years, and most cases were males (55.3%). Hypertension was the most prevalent risk factor among all patients. Compared to our findings, the hospital length of stay was longer in this research (13.25 ± 13.48 days). The mortality rate was higher (21.7%). They also did not find any significant correlations between the stroke outcome and study variables. Their results only determined that cases with blood sugar lower than 144 had a better 3-month outcome. Based on their conclusion, age over 60 years old and admission NIHSS more than 12 were the only significant risk factors for death (18). In contrast to our conclusion, age was not a significant risk factor, while

an NIHSS score of more than 10 was significant in mortality.

Dong et al. and Tosta et al. indicated that mean NIHSS and MRS scores and hospitalization duration significantly decreased in AIS patients who received UIT (19, 20).

Albers et al. showed a 1-month mortality rate of 13% among patients with AIS undergoing UIT. Further, 35% of their evaluated cases considerably improved with MRS less than 1, and 43% were independent with MRS scores less than 2. In the meantime, admission NIHSS more than 10 showed less improvement (21).

According to the previous research in the literature and especially the existed data in Iran, we tried to overcome their limitations in our study; thus, we assessed the short-term outcome of a large sample of AIS patients who underwent UIT in a prospective design. The study endpoints emphasized that UIT in AIS could decline the mortality rate. NIHSS score > 10 and MRS score > 3 may be associated with a worse prognosis.

5.1. Limitations

One limitation of this study was difficulties in gathering follow-up data. Some patients or their guardians had problems recalling information. We could not evaluate NIHSS and MRS scores after discharge.

5.2. Conclusions

The mortality rate was estimated to be 4.08% in this study, lower than what previously was reported in AIS without UIT treatment. NIHSS and MRS scores were significantly related to poorer outcomes.

Footnotes

Authors' Contribution: M. M. and E. V. conceived the study, designed the trial, and supervised the conduct of the trial and data collection. M. M., M. A., and M. Z. undertook the recruitment of participating centers and patients and managed the data, including quality control. E. V. provided statistical advice on study design and analyzed the data. E. V. drafted the manuscript, and all authors contributed substantially to its revision. E. V. takes responsibility for the paper as a whole.

Conflict of Interests: The authors declare no conflict of interest.

Data Reproducibility: No new data were created or analyzed in this study. Data sharing does not apply to this article.

Ethical Approval: This study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.MEDICINE.REC.1399.049) (ethics.research.ac.ir/form/a7b3fvq9x44s739w.pdf).

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