

## Study Clinical Manifestations And Computerized Tomography Characteristics Of Acute Ischemic Stroke Patients In The First 6 Hours After Symptom Onset

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### Abstract

**Purpose** became the description of the clinical characteristics and signs of acute ischemic stroke patients in a computerized tomography study at the first 6 hours after symptom onset.

**Materials and Methods:** There were analyzed data of 134 acute ischemic stroke patients in the first 6 hours in 108 hospitals in time of a year observation. Have been described the clinical characteristics of acute ischemic stroke patients (history of the disease, neurologic deficits of sudden onset, time of onset) early computerized tomography images signs, National Institutes of Health Stroke Scale scores, Alberta stroke program early computerized tomography scores. The average age of the observed patients was  $64.35 \pm 12.37$ , from 21-85.

**Results:** Was fixed the common history of disease caused the acute ischemic stroke. The causes were hypertension (55.2%) and atrial fibrillation (27.6%). Clinical manifestations of acute ischemic stroke have included unilateral paresis (95.5%), aphasia (70.9%), and Facial palsy (91%). Consciousness was fixed in 68.9%. Other characteristics include headache, dizziness, and gaze preference were at a low rate. The National Institutes of Health Stroke Scale score averages  $17.37 \pm 6.8$ . In the computerized tomography image: 55.22% of patients had a reduced contrast attenuation of the cerebral parenchyma, 70.89% had large blood vessels occlusion, 81.35% had a frontal cerebral artery. Average Alberta stroke programme early computerized tomography scores  $7.87 \pm 1.39$ . Clinical characteristics of the vertebrobasilar arterial system stroke were coma, dizziness. Signs of large vessel occlusion were coma, gaze preference, and language disorders.

**Conclusions:** Clinical symptoms of acute ischemic stroke patients in the first 6 hours were abundant. However, the most common signs were unilateral paresis, facial palsy and language disorders. Nearly half of patients with acute ischemic stroke in the first 6 hours had no lesions on computerized tomography imaging.

**Keyword:** acute ischemic stroke, clinical manifestations, computerized tomography image

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## 1. Introduction

The medical care system has its common goal - to save lives and to care about a patient's comfortable future life. So, the save the brain cells of the acute ischemic stroke (AIS) patient is not only about saving the patient's life but about the race against time. In each minute, 1.9 million neurons, 14 billion synapses, and 12 km (7.5 miles) of myelinated fibers are destroyed. In vitro, the nerve cells have a rapid change after 20 minutes of ischemic. These changes were: Cellular swelling, mitochondrial decay, which changes most markedly in the fourth hour to the sixth hour [1-2].

The National Institutes of Health Stroke Scale (NINDS) study in 1995 confirmed intravenous recombinant tissue plasminogen activator (rtPA - Alteplase) in the first 3 hours, which helped an additional 13% improvement compared with standard treatment group. 2008 the European Cooperative Acute Stroke Study (ECASS) III showed rTPA was beneficial in AIS patients within 3 to 4.5 hours. A meta-analysis based on 12 randomized controlled trials validated the benefits of Intra-arterial rtPA within 6 hours of onset (OR 1.17, 95% CI: 1.06-1, 29; p=0.001) [3]. So, the generations of mechanical thrombiectomy devices had applied for removing thrombi from the neurovasculature have expanded the treatment window in AIS.

There were 8 reputation trials like SYNTHESIS, IMS III, MR RESCUE, MR CLEAN, ESCAPE, SWIFT PRIME, EXTEND-IA, and REVASCAT. They have been used for a goal to analyze and make fundamentalist for the American Heart Association/American Stroke Association (AHA/ASA), which have published an updated 2015 guideline for the early management of AIS patients regarding endovascular treatment. However, each trial had different window treatments. For example, the ESCAPE trial collected patient in 12 hours, MR RESCUE and REVASCAT trial was 8 hours, and the remaining trials had window treatments was 5 to 6 hours [3-5]. Finally, the treatment guidelines of AHA/ASA had high consensus with the treatment window in 6 hours.

All clinical and in vitro evidence showed that the first 6 hours after symptom onset was the golden time for AIS treatment. Therefore, the investigation of clinical characteristics, computerized tomography AIS in the first 6 hours will have a great necessary [6-7]. So, **the main aim** of the study was to determine clinical manifestations and computerized tomography characteristics of AIS patients in the first 6 hours after symptom onset.

## **2. Material and Methods**

Consecutive patients presenting with AIS patients in the first 6 hours after symptom onset between July 2016 and July 2017 were enrolled in the study. We followed the patients until discharge.

### **2.1. Patient selection**

Inclusion criteria were 85 years old or younger, patients arrived emergency department before 6 hours after symptom onset, have symptoms of AIS (FAST: Facial drooping; Arm weakness; Speech difficulties and time is of the essence)

Exclusion criteria included the presence of cerebral hemorrhage or patients had symptoms onset lasts over 6 hours

### **2.2. Imaging and clinical assessment**

The clinical assessment has included history and symptoms onset. A focused medical history for patients with IAS aims to identify risk factors for atherosclerotic and cardiac disease, including the following: Hypertension, diabetes mellitus, tobacco use, high cholesterol, history of coronary artery disease, heart failure, or atria fibrillation.

Common signs and symptoms of stroke include the abrupt onset of any of the following: Hemiparesis, monoparesis, or (rarely) quadriparesis; hemisensory deficits; monocular or binocular visual loss; visual field deficits; diplopia; dysarthria; facial droop; ataxia; vertigo (rarely in isolation); aphasia; sudden decrease in the level of consciousness. NIHSS scores were assessed on admission and discharge.

The current standard is noncontrast computed tomography (NCCT) of the head because it is fast and widely available, but we used computed tomography angiography (CTA) as soon as the patient admission. We excluded intracranial hemorrhage and found carefully early sign on NCCT, calculated the ASPECTS (Alberta Stroke Program Early CT score) score.

On CTA, we have located the cerebral artery occlusion and evaluated CTA collateral score.

### **2.3. Statistical methods**

Categorical variables were expressed with their frequency distributions and continuous variables as mean (SD) and SD [8]. IBM SPSS 22.0 software was used to perform all of the analyses.

## **3. Results**

### 3.1. Baseline characteristics

Was counted the average age of the observed patients (Table 1). So, the mean age was fixed  $64.35 \pm 12.37$  years. The highest age was 85, the lowest - 21. The age group most encountered is over 60 years old. There were 55 women (41%). Mean time was  $213.38 \pm 92.54$  minute, the fastest is 15 minute and the limit is 360 minute. The anterior cerebral circulation system had accounted 81.35%.

We have also analyzed the predictors of the AIS development (Figure 1). Hypertension (55.2%) and atrial fibrillation (27.6%) were the most common medical history of ischemic stroke patients. Less medical history were other factors: diabetes, heart valve disease, duration smoking history.

### 3.2. Clinical manifestations

It was critical important to study the clinical manifestation of the AIS (Table 2).

The common clinical signs of AIS patients in the first 6 hours were unilateral paralysis (95.5%), facial palsy (91.0%), and aphasia (70.9%). Other manifestations were: dizziness, coma, vomiting. The coma, dizziness were more common in patients at posterior cerebral circulation occlusion with  $p < 0.05$ .

The mean NIHSS score was 17.37 (Table 3). The highest NIHSS score was 42 points, the lowest score was 2 points, the mode NIHSS score was 21. Mostly patients had NIHSS scores from 16 to 29 with 55.97%. The proportion of patients with NIHSS scores below 6 and over 30 accounts about 10% (Figure 2).

NIHSS data at admission are needed to assess the stroke severity of the population treated, and are helpful to place into perspective the NIHSS discharge data. NIHSS discharge from  $< 6$  was 32.01%.

The next way was the analysis of the computerized tomography results that have been conducted in AIS patients (Table 4). Was fixed, in the first 6 hours after symptom onset, CT image in AIS patients was normal about 44.78%. The large vessel occlusion stroke had accounted for 70% and anterior cerebral circulation occlusion was 81.35%. But several early signs of acute ischemic stroke were fixed in table 5.

There were 74 patients with AIS, who have early sign on NCCT, accounted for 55.22%. Signs of early ischemic were cortical sulcal effacement (25.6%); loss of grey-white matter differentiation (24.3%); loss of the insular ribbon (31.1%); and hyperattenuation of large vessel (22.9%, eg: hyperdense middle cerebral artery sign).

The ASPECT score was calculated for AIS patients with blood supply location of the middle cerebral artery (including internal carotid artery occlusion and segmental M1), which was 63 patients. In the

first 6 hours, there were 4 patients with ASPECT score below 5, accounted for 6.35%. The most patients with ASPECT score above 6. The mean ASPECTS score was 7.8 (Table 6).

In patients with large vessel occlusion, mainly middle cerebral artery occlusion (M1 segment 25.37%, M2 segment 5.97%) and the internal carotid artery (21.64%). The posterior cerebral artery consists of the basilar artery, vertebral artery and posterior cerebral artery occupied 14.18% (Table 7). Patients with small blood vessels included the anterior and posterior cerebral circulatory system.

## **4. Discussion**

### **4.1. Baseline characteristics**

Baseline characteristics of all patients are given in Table 1, it has shown mean age was  $64.35 \pm 12.37$  years. The highest age was 85, the lowest was 21. The age group most encountered was over 60 years old. There were 55 women (41%). Mean time was  $213.38 \pm 92.54$  minute, the fastest is 15 minute and the limit is 360 minute. The anterior cerebral circulation system had accounted 81.35%. The mean age in our study was similar to the SWIFT trial in 2012 by Saver J.L. et al. [3]. Thereby the mean age of the group  $65.4 \pm 14.5$ , Merci group  $67.1 \pm 11.1$ . Earlier research by Nguyen Hoang Ngoc at 108 hospital showed that the mean age was 64.7, our results are quite similar due to the same location, where had collected data.

About time, the fastest time from onset to admission at emergency department was 15 minutes, the latest time was 6 hours, the mean time was about 213 minutes. The result was similar Nguyen Hoang Ngoc et al. at 108 hospital [9].

The anterior cerebral circulation system had accounted 81.35%. Thus, the anterior cerebral circulation system occlusion had carried large proportion, the same result of other authors [3,9-10].

The medical history of AIS patients has always been emphasized. Our result showed that hypertension (55.2%) and atrial fibrillation (27.6%) were the most common medical history of AIS patients. Less medical history were diabetes, heart valve disease, smoking history. The rate of hypertensive patients was consistent with description of Nguyen Van Tuyen (46.5%) [11]. However, the rate of atrial fibrillation in our study was lower (Nguyen Van Tuyen 40.7%, and Nguyen Quang Anh (64.3%). The medical histories were also reported similarly of Nguyen Hoang Ngoc et al. [9].

### **4.2. Clinical manifestations**

The common clinical signs of AIS patients in the first 6 hours were unilateral paralyzed (95.5%), were fixed facial palsy (91.0%) and aphasia (70.9%). Other manifestations were dizziness,

coma, vomiting. The coma, dizziness were more common in patients at posterior cerebral circulation occlusion with  $p < 0.05$ . In our study, the all level of paralysis had noted so that the rate paralysis of AIS patients was rather higher than result of Do Duc Thuan et al study, which had noted high level of paralysis. The rate severe paralysis patients of Do Duc Thuan et al study was 79.24% [12]. The European study about compare clinical signs between anterior and posterior cerebral circulation showed that the rate paralysis of AIS patients of anterior cerebral circulation accounted 96% was higher than posterior cerebral circulation with 80% [13]. The symptoms of aphasia, facial drops were similar to Do Duc Thuan et al study and The European study. Thus classic symptoms such as paralysis, aphasia and facial drops were noted.

Interestingly, there was a difference in clinical manifestations between anterior and posterior cerebral circulation occlusion. We found that coma, dizziness was more common in patients with posterior circulation with  $p < 0.05$ . The gaze preference signs were quite specific for large vessel occlusion, which we had noted of anterior cerebral circulation occlusion stroke were more than posterior. However the number of AIS patients, who had this sign was not much so that was no statistically significant difference. The trial of Peter Vanacker et al in Euro had showed that coma and eye movement disorders were common of posterior occlusion. The others sign as unilateral paralysis, sensory disorders and language disorders were more common in the anterior cerebral circulation [13].

The mean NIHSS score was fixed in 17.37. The highest NIHSS score was 42 points, and the lowest - 2 points, the mode NIHSS score was 21. Mostly patients (55.97%) had NIHSS scores from 16 to 29. The proportion of patients with NIHSS scores below 6 and over 30 accounts about 10%. The most studies had reported a mean NIHSS of 17. We had patients with basilar artery occlusion with deep coma when admission so the NIHSS score was recorded highest 42 [9-10,13].

At 108 hospital, we have applied mechanical thrombectomy to revascularization AIS with large vessel occlusion brought good results, which showed on figure 2. NIHSS data at admission are needed to assess the stroke severity of the population treated, and are helpful to place into perspective the NIHSS discharge data. NIHSS discharge from  $< 6$  was 32.01%. This result was similar of Daniel Behme & partner in Germany [10].

#### **4.3. Computerized tomography characteristics**

In terms of CT image with AIS patients in the first 6 hours after symptom onset, CT image was normal about 44.78%. The large vessel occlusion stroke had accounted for 70% and anterior cerebral circulation occlusion was 81.35%. The studies at 103 hospital previously had reported that up to 39.62% of patients with normal CT image.

There were 74 patients with AIS, who have early sign on NCCT, accounted for 55.22%. Signs of early ischemic were cortical sulcal effacement (25.6%); loss of grey-white matter differentiation (24.3%); loss of the insular ribbon (31.1%); and hyper attenuation of large vessel (22.9%, eg: hyper dense middle cerebral artery sign). Similar results of the study by the authors at the 103 hospital [11].

The ASPECT score was calculated for AIS patients with blood supply location of the middle cerebral artery (including internal carotid artery occlusion and segmental M1), which was 63 patients. In the first 6 hours, there were 4 patients with ASPECT score below 5, accounted for 6.35%. The most patients with ASPECT score above 6. The mean ASPECTS score was 7.8. This rate is quite similar to previous research by Nguyen Hoang Ngoc et al at 108 Hospital [9,14-15].

Regarding the position of vessel occlusion in our study, patients with large vessel occlusion, mainly middle cerebral artery occlusion (M1 segment 25.37%, M2 segment 5.97%) and the internal carotid artery (21.64%). The posterior cerebral artery consists of the basilar artery, vertebral artery and posterior cerebral artery occupied 14.18%. Patients with small blood vessels included the anterior and posterior cerebral circulatory system. Patients with small vessels occlusion including the anterior and posterior cerebral circulation. Similar results trial of Behme D. with coauthors in 2014 with 129 AIS patients, in which MCA - 48%; ICA - 33%, basilar artery occlusion - 16%. This was also the result of TREVO 2: 60% and SWIFT: 61% [3,10,16-17].

## **5. Conclusions**

Results from 134 AIS patients in the first 6 hours after symptom onset at 108 Hospital, we found that: common clinical signs of AIS patients include unilateral paralysis, aphasia and facial palsy, central ventricular episodes. On CT images, nearly 45% patients showed normal, mainly with large vessel occlusion in anterior cerebral circulation. There were significant differences in clinical symptoms between the anterior and posterior circulation stroke.

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## Tables

**Table 1.** Baseline characteristics

Characteristics		Number of Patients	Rate (%)
Age (years)	Mean ( $\bar{X} \pm SD$ )	64.35± 12.37	
	Min	21	
	Max	85	
Age groups (years)	≤ 40	4	3.0
	40-59	40	29.9
	≥ 60	90	67.1
Gender	Female	55	41.0
	Male	79	59.0
Time	Mean ( $\bar{X} \pm SD$ )	213.38 ± 92.54	

(minute)	Min	15	
	Max	360	
	Mode	300	
Blood vessels of the brain	Anterior circulation	109	81.35
	Posterior circulation	25	18.65

**Table 2.** Clinical signs of AIS patients in the first 6 hours after symptom onset

Clinical manifestations	AIS Patients		Anterior circulation		Posterior circulation		p
	patients' number, n=134	Rate 100%	patients' number, n=109	Rate 81,35%	patients' number, n=25	Rate 18,65%	
coma	16	11.94	2	1.83	14	56.0	<0.05
dizziness	16	11.94	3	2.75	13	52.0	<0.05
vomiting	11	8.21	8	7.34	3	12.0	>0.05
gaze preference	15	11.2	13	11.92	2	8.0	>0.05
Aphasia	95	70.89	79	72.48	16	64	>0.05
unilateral paralysis	128	95.5	108	99.08	20	80.0	<0.05
Facial palsy	122	91.0	100	91.74	22	88.0	>0.05

**Table 3.** NIHSS score of patient on admission

NIHSS score		Patients count (n=134)		Rate (%)
NIHSS	Mean ( $\bar{X} \pm SD$ )	17.37±6.8		
	< 6	7	5.22	
NIHSS	6 - 15	44	32.83	
groups	16 - 29	75	55.97	
	≥30	8	5.98	

**Table 4.** computerized tomography characteristics of acute ischemic stroke patients in the first 6 hours after symptom onset

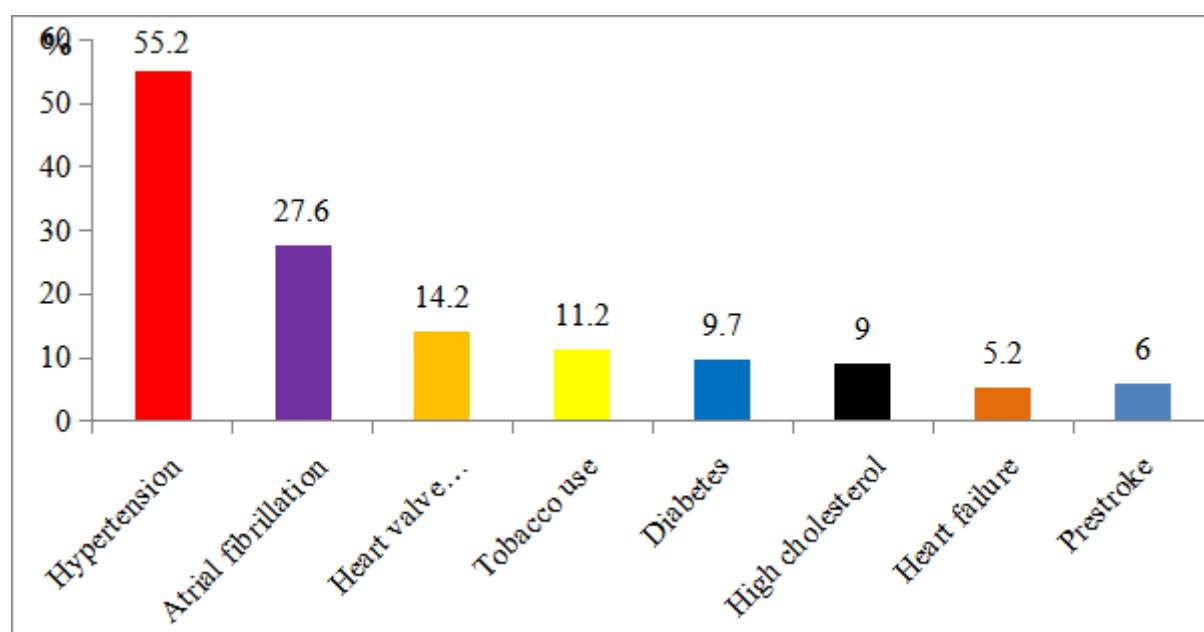
Characteristics	Patients count	Rate (%)
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(n=134)		
Hypoattenuation	74	55.22
Normal	60	44.78
Large vessel occlusion	95	70.89
Lacunar stroke	39	29.11
Anterior cerebral circulation	109	81.35
Posterior cerebral circulation	25	18.65

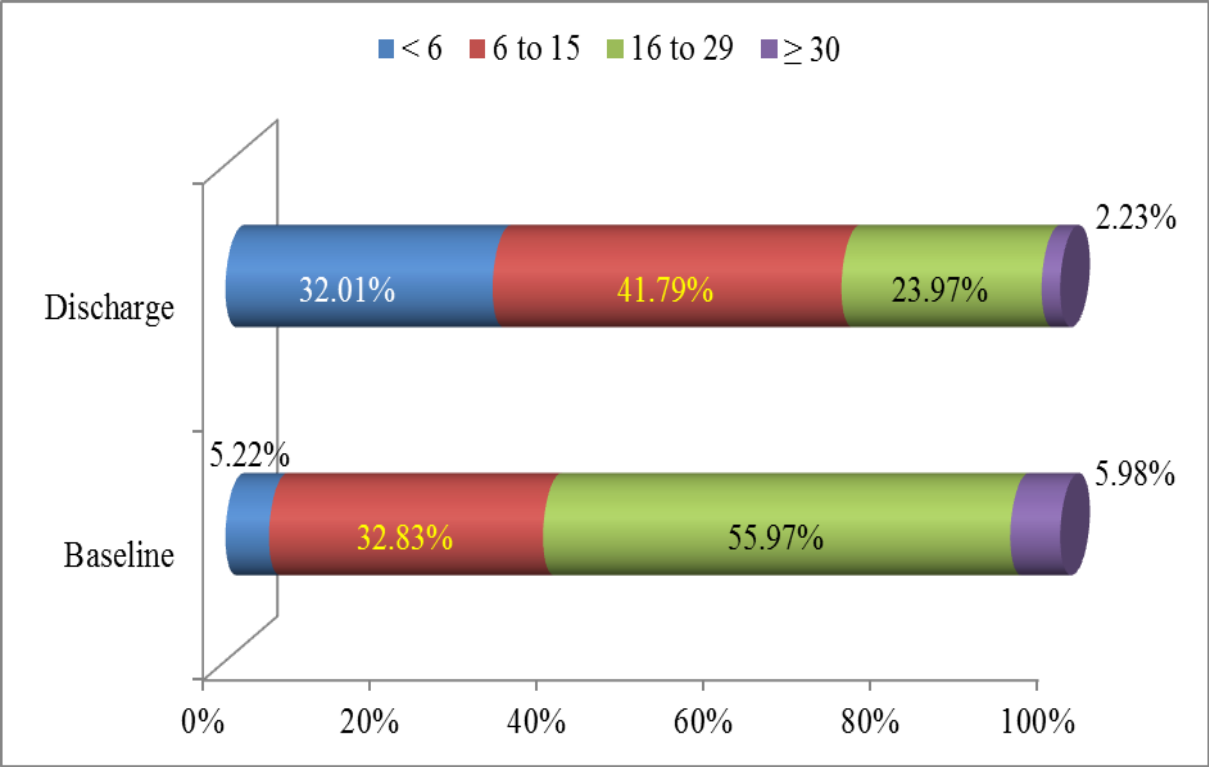
**Table 5.** Early signs of acute ischemic stroke patients

Early sign on NCCT	Patients count (n=134)	Rate (%)
Cortical sulcal effacement	19	25.6
Loss of grey-white matter differentiation	18	24.3
Loss of the insular ribbon	23	31.1
Obscuration of the lentiform nucleus	15	20.3
Obscuration of the Sylvian fissure	20	27.0
Hyperattenuation of large vessel	17	22.9

## Figures



**Figure 1.** Medical history of ischemic stroke



**Figure 2.** Distribution of NIHSS scores at baseline and discharge.