Prevalence of Acute Cardioembolic Stroke in Stroke Unit in Rajavithi Hospital

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Abstract

Objective: Acute cardioembolic stroke causes the most severe disease and the most recurring, which can be found in approximately 20-30% of ischemic stroke patients. There are treatment and prevention of recurrence by using anticoagulant drugs differs from treatment and prevention of recurrence for other causes. Correct diagnosis and appropriate treatment are what patients should receive.

Materials and Methods: Data from the medical record collected from 297 acute ischemic stroke patients admitted to the stroke unit in Rajavithi Hospital from 1 July 2019 to 30 June 2020 and analyzed using descriptive statistics.

Results: Of the total number of 297 patients, 9.1% were diagnosed with acute cardioembolic stroke. The severity of acute ischemic stroke was measured by NIHSS, the median was 4 (1-24), and the outcome was measured by mRS score at admission, the median was 3 (1-5) and mRS before discharge, the median was 1 (1-6). There was one predictive factor for cardioembolic stroke: age (Adjust odds ratio of 1.04; 95% CI, 1.01-1.08). Of the total subjects, 23.2% had clinical suspicion for a definite cardioembolism that was performed echocardiogram 82.6%, holter monitoring 52.1% and both 49.3%.

Conclusions: The prevalence of acute cardioembolic strokes accounted for 9.1% of all acute ischemic strokes, which was less than previous study.

Keywords: Cardioembolic stroke, Echocardiogram, Holter monitoring

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Introduction

Stoke is the most common cause of death in Thailand, the most common cause of disability in women, and the third in males. In Thailand, from overall 67 million people, the prevalence of stroke is 1.88% in over 45 years old and more common in females than males.[1] About two-thirds of stroke is ischemic stroke, stroke subtype divided into ischemic stroke and hemorrhagic stroke.[2] Therefore, investigating the cause for treatment and the prevention of recurrence is very important.

From the classification of the causes of Ischemic stroke according to Toast classification[3], there were five types of causes, each with differences in severity and recurrence rates. The most common cause in Thailand is lacunar infarction 37%, followed by large artery atherosclerosis 31% and cardioembolic stroke 22%.[1]

Acute cardioembolic stroke, caused by blood clots from the heart, is the cause that causes the most severe of the disease and the most recurring[4], can be found in approximately 20-30% of ischemic stroke patients.[5] There are treatment and prevention of recurrence by using anticoagulant drugs differs from treatment and prevention of recurrence for other causes. Correct diagnosis and appropriate treatment are what patients should receive.

Acute cardioembolic stroke can be diagnosed based on history, physical examination, and the symptoms that are compatible with acute cardioembolic stroke and send additional tests to confirm the diagnosis, electrocardiogram (EKG) or electrocardiogram monitoring (EKG monitoring) while in the hospital together with the examination echocardiogram and holter monitoring such examination must be performed by a cardiologist, specific examination equipment, examination time and cost.

This study investigated the prevalence of acute cardioembolic stroke among ischemic stroke patients treated at the stroke unit in Rajavithi Hospital from 1 July 2019 to 30 June 2020. And study factors associated with cardioembolic stroke.

Materials and Methods

This study was cross-sectional descriptive studies from July 1, 2019, to June 30, 2020, by the research committee approved in Rajavithi Hospital. (Project No. 63195 dated December 1, 2020)

A sample of the study was the patients with acute ischemic stroke, both recurrent and new cases. The inclusion criteria were patients aged 18 years and over. The exclusion criteria were patients with incomplete medical record data, patients diagnosed with hemorrhagic stroke (except for the patients with intracranial hemorrhage after ischemic stroke), and transient ischemic attack (TIA) patients.

A total of 297 persons, who met the inclusion criteria, were obtained from all acute ischemic stroke patients admitted to the stroke unit in Rajavithi Hospital from 1 July 2019 to 30 June 2020. The diagnostic for acute cardioembolic stroke were determined in patients with clinical suspicion for a definite cardioembolism, which includes sudden onset to the maximal deficit (<5 min), decreased level of consciousness at the onset, and a rapid regression of symptoms (the spectacular shrinking deficit syndrome) and found evidence of cardioembolic sources (12-lead EKG, echocardiogram and holter monitoring).[3,5-8]

The research tool was the case record form, which contains the data collection of 1. Baseline characteristics including age, gender, and smoking 2. Comorbidity that was a risk factor for ischemic stroke, such as diabetes mellitus, hypertension, dyslipidemia, and cardioembolism risk factor [atrial fibrillation, prosthetic valve, recent myocardial infarction (within 4 weeks)] 3. Information on acute ischemic stroke including NIHSS at admission (0-42), Modified Rankin Scale (mRS) at admission and before discharge (0-6), and clinical suspicion for a definite cardioembolism 4. Additional tests include 12-leads electrocardiogram (EKG), echocardiogram (transthoracic echocardiogram) and holter monitoring.

Data analysis was done by analyzing statistical results. Categorical data reported by percentage. Continuous data in case of normal distribution reported with mean and standard deviation. If the data not normally distributed, it was reported with the median, minimum, and maximum. To compare categorical data using Chi-square test or Fishers' exact test. Continuous data comparison among two independent populations, the Student's t-test used in the case of a normal distribution and the Mann-Whitney U test used in the case of non-normal distribution. The correlation factor analysis performed using binary logistic regression statistics and risk reporting with OR (95% CI). For all tests, the statistical significance level was determined at a p-value <0.05, and the data obtained were summarized and reviewed.

Result

Of the total number of 297 patients, 9.1% were diagnosed with acute cardioembolic stroke, 21-97 years (mean age 60.87 ± 14.56 years), 52.2% male, 24.6% smoking, 81.8% had comorbidity or cardioembolic risk (dyslipidemia 76.5%, followed by hypertension 75.3% and diabetes mellitus 40.3% respectively and the most common cardioembolic risk was atrial fibrillation 2.9%). The severity of acute ischemic stroke was measured by NIHSS, the median was 4 (1-24), and the outcome was measured by mRS score at admission, the median was 3 (1-5) and mRS before discharge, the median was 1 (1-6). All of them 12-lead EKG were done and 6.4% positive for atrial fibrillation according to Table 1.

There was one predictive factor for cardioembolic stroke: age (Adjust odds ratio of 1.04; 95% CI, 1.01-1.08) according to Table 2 and Table 3.

The NIHSS and mRS in people with cardioembolic stroke were significantly higher than those with non-cardioembolic strokes, median of NIHSS was 9 (2-24), median of mRS at admission was 4 (1- 5) and median of mRS at discharge was 3 (0-6) according to Table 4.

From the total patients, 23.2% had clinical suspicion for a definite cardioembolism that was performed echocardiogram 82.6%, holter monitoring 52.1% and both 49.3% according to Table 5 and case with a positive result from echocardiogram or holter monitoring was diagnosed with acute cardioembolic stroke 100.0% according to Table 6.

Table 1 Baseline characteristic (n=297)

Factors	Values
Gender	
Male	155 (52.2)
Female	142 (47.8)
Age (years)	60.87±14.56
Comorbidity	
No	54 (18.2)
Yes	243 (81.8)
Dyslipidemia	186 (76.5)
Hypertension	183 (75.3)
Diabetes mellitus	98 (40.3)
Atrial fibrillation	7 (2.9)
Prosthetic valve	1 (0.4)
Recent myocardial infarction (within 4 weeks)	1 (0.4)
Smoking	
No	224 (75.4)
Yes	73 (24.6)
NIHSS	4 (1 - 24)
mRS at admission	3 (1 - 5)
mRS at discharge	1 (1 - 6)
Clinical suspicion for a definite cardioembolism	
No	228 (76.8)
Yes	69 (23.2)
12- lead EKG	
Negative for atrial fibrillation	278 (93.6)
Positive for atrial fibrillation	19 (6.4)

Values are presented as n (%), mean ± SD, median (min-max)

NIHSS = National Institutes of Health Stroke Scale, mRS = Modified Rankin Scale,

EKG = electrocardiogram

Table 2 Factors associated with cardioembolic stroke (n=297)

Factors	Cardioembolic		p-value
	Yes (n=27)	No (n=270)	
Gender			0.212
Male	11 (7.1)	144 (92.9)	
Female	16 (11.3)	126 (88.7)	
Age (years)	69.93±13.89	59.96±14.33	0.001*
Comorbidity			0.601
No	6 (11.1)	48 (88.9)	
Yes	21 (8.6)	222 (91.4)	
Dyslipidemia	16 (8.6)	170 (91.4)	
Hypertension	21 (11.5)	162 (88.5)	
Diabetes mellitus	9 (9.2)	89 (90.8)	
Atrial fibrillation	6 (85.7)	1 (14.3)	
Prosthetic valve	1 (100.0)	0 (0.0)	
Recent myocardial infarction (within 4 weeks)	1 (100.0)	0 (0.0)	
Smoking			0.216
No	23 (10.3)	201 (89.7)	
Yes	4 (5.5)	69 (94.5)	

Values are presented as n (%), mean ± SD, *significant at p-value <0.05 by Chi-square test, Fishers' exact test and Student's t-test.

Table 3 Prognostic factors for cardioembolic stroke

Factors	Crude OR (95%CI)	p-value	Adjust OR (95%CI)	p-value
Age	1.05 (1.02-1.08)	0.001*	1.04 (1.01-1.08)	0.018*

*significant at p-value <0.05, Adjust for sex, comorbid and smoking.

Table 4 Disease severity and patient disability of cardioembolic stroke

Severity and disability	Cardioembolic stroke		p-value
	Yes (n=27)	No (n=270)	
NIHSS	9 (2 - 24)	4 (1 - 24)	0.010*
mRS at admission	4 (1 - 5)	2 (1 - 5)	0.004*
mRS at discharge	3 (0 - 6)	1 (0 - 6)	<0.001*

Median (max-min), *significant at p-value <0.05 by Mann Whitney U test.

Table 5 Diagnostic tools for cardioembolic stroke in clinical suspicion for a definite cardioembolism patients (n=69)

Diagnostic tools	Values
Echocardiogram (n=57)	57 (82.6)
Negative for cardioembolic stroke	45 (78.9)
Positive for cardioembolic stroke	12 (21.1)
Atrial fibrillation	8 (66.7)
Dilated cardiomyopathy (LVEF <30%)	3 (25.0)
Prosthetic valve	1 (8.3)
Holter monitoring (n=36)	36 (52.2)
Negative for atrial fibrillation	31 (86.1)
Positive for atrial fibrillation	5 (13.9)
Both echocardiogram and holter monitoring was done	34 (49.3)

Values are presented as n (%)

LVEF=left ventricular ejection fraction

Table 6 Result of diagnostic tool for cardioembolic stroke in clinical suspicion for a definite cardioembolism patients (n=69)

Diagnostic tools	Cardioembolic stroke		p-value
	Yes (n=27)	No (n=42)	
Echocardiogram (n=57)			< 0.001*
Negative for cardioembolic stroke	7 (15.6)	38 (84.4)	
Positive for cardioembolic stroke	12 (100.0)	0 (0.0)	
Holter monitoring (n=36)			< 0.001*
Negative for atrial fibrillation	1 (3.2)	30 (96.8)	
Positive for atrial fibrillation	5 (100.0)	0 (0.0)	

Values are presented as n (%), *significant at p-value <0.05 by Fishers' exact test.

Discussion

This study found that the prevalence of acute cardioembolic stroke accounted for 9.1% of all acute ischemic stroke, less compared to previous studies abroad[5] and in Thailand[1] found that the proportion of cardioembolic stroke is estimated in 20-30% of all acute ischemic strokes. This may be because the number of additional tests for cardioembolic stroke diagnosed with an echocardiogram and holter monitoring is too small. In this study, additional tests were performed only in 69 patients (23.2%) with clinical suspicion for a definite cardioembolism that performed echocardiogram 82.6%, holter monitoring 52.1% and both 49.3%.

There was one predictive factor for cardioembolic stroke: age, with an increase in age every one year, is likely to develop cardioembolic stroke 1.04 times. Consistent with a previous study that ischemic strokes have more prevalence in older patients and patients over 70 with heart disease which was associated with both AF and paroxysmal AF.[9]

The severity from NIHSS and outcome from mRS in the cardioembolic stroke group are significantly higher than in the non-cardioembolic stroke group. Consistent with the previous study found that cardioembolic stroke has a significantly higher mortality rate than lacuna infarction and atherothrombotic stroke ($P < 0.01$). Cardioembolic infarction is also associated with a lower rate of absence of functional limitation at discharge from the hospital, which may be related to the greater size of the lesion of cardioembolic stroke.[6]

There are studies[9-12] investigating the need for an echocardiogram and holter monitoring in the diagnosis of cardioembolic stroke found that echocardiogram and holter monitoring should be performed in all patients with acute ischemic stroke as transthoracic echocardiogram and holter monitoring for at least 24hr and transesophageal echocardiogram in selected cases. However, some studies[13] have found that the diagnostic yield of echocardiogram for diagnosis of cardioembolic stroke should be tested for all cases in patients under 50 years of age and selected only in patients over 70 years of age. Due to cardioembolic stroke has a different treatment from another type of ischemic stroke, the examination to determine the cause of an acute ischemic stroke is of great importance. Therefore, should be examined echocardiogram and holter monitoring in all acute ischemic stroke patients.

The limitation in this study is the limited number of tools used for holter monitoring in Rajavithi Hospital. It is required to examine many patients with other types of heart disease in the hospital, which has led to some acute ischemic stroke patients not being tested and may have examined the only echocardiogram causing paroxysmal atrial fibrillation may not be detected.

Conclusion

In cases of less investigation, there may be a hidden cardioembolic source, that increases the risk of recurrent stroke, which may be corrected by adequate and proper investigation, increase the number of tools needed or add more time for holter monitoring.

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