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Correlation of Lacunar Infarct on Head Ct Scan with Dysarthria in Haji Adam Malik General Hospital in 2019

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ABSTRACT

Introduction: Stroke is the main cause of mortality and morbidity in Indonesia. Dysarthria is a symptom that can be seen from stroke. These symptoms occur in 15% of stroke events. Dysarthria is a motor speech disorder. Atypical lacunar stroke (ALS) is a stroke subtype that rarely occurs in one in 14 lacunar strokes or occurs in 6.8% of lacunar strokes, where isolated dysarthria or dysarthria facial paresis is the most common form of presentation.

Method: This study is an observational analytic study with a case-control type of research with the aim of knowing the relationship between CT scan images of lacunar infarcts and dysarthria in ischemic stroke patients. The population in this study were all medical records of stroke patients who went to the Department of Neurology at the Haji Adam Malik General Hospital (RSUPHAM) Medan for a period of one year from January 1, 2019 to December 31, 2019 who underwent a head CT scan for 18 patients.

Results: The subjects on the CT scan results of lacunar infarction with dysarthria 18 people (72%), and 7 people (28%) on the CT scan results there is no lacunar infarction. The same number and percentage were also found in the non-chivalrous control group. The test results obtained p value = 1,000 and odd ratio = 1.00, in other words there is no significant relationship between lacunar infarct and dysarthria.

Conclusion: No significant relationship was found between the incidence of lacunar infarction and the incidence of dysarthria. The population with the most lacunar infarcts is men, hypertension, obesity, hypercholesterolemia, smoking and diabetes.

Keywords

Lacunar Infarct, Head CT Scan, Dysarthria, Incidence, Atypical Lacunar Stroke

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INTRODUCTION

Stroke is the main cause of mortality and morbidity in Indonesia.[1] Stroke is a syndrome caused by cerebral blood circulation disorders with acute onset, accompanied by clinical manifestations in the form of neurological deficits and not caused by tumors, trauma, or central nervous system infections.[2] One of the stroke subtypes is lacunar infarction which can be diagnosed by computed tomography (CT) scan of the head which is seen as a small hypodensity in the basal ganglia, brainstem, or subcortical structures.[1] Lacunar infarcts are cerebral lesions that have risk factors, natural history, and clinical management that are significantly different from those of other cerebral infarcts. Computed tomography (CT) is an imaging method applied to determine lacunar locations.[3] Lacunar infarct is a common anatomic manifestation of small vessel disease.[4]

Lacunar infarction or lacunar stroke is a stroke that occurs due to blockage of a small branch of a larger blood vessel. Vascular pathways are fragmented in the brain, lacunar strokes tend to occur in areas far from the cerebral surface, where there are many branches of smaller blood vessels. CT scan is always used as a

diagnostic tool for various clinical disorders in patients. CT scan of the head is often done to determine the diagnosis of neurological disorders in patients, such as stroke, sensory and motor disorders, including speech disorders. Speech disorders usually occur due to lesions in the Brocca area of the brain, whether due to circulation disturbances by thrombus or bleeding. These anatomical changes can be monitored with a CT scan of the head. According to the World Health Organization (WHO), stroke has major and minor symptoms with major symptoms including unilateral/bilateral motor disturbances, unilateral/bilateral sensory disturbances, aphasia/dysphasia and hemianopia. Minor symptoms may include dysarthria, dizziness, vertigo, diplopia and seizures.[5]

Economically, the impact of stroke will have an effect on decreasing productivity (Indonesian Stroke Foundation, 2012).[16] Lacunar infarcts account for more than 25% of brain infarcts, but clinical data on patients with recurrent lacunar infarcts are rare.[4] Although lacunar infarcts are small in size, they can cause major problems and many patients have intellectual and physical disabilities such as speech disorders.[4]

Dysarthria is a symptom that can be seen from stroke. These symptoms occur in 15% of stroke events. Dysarthria is a motor speech disorder. The muscles of the mouth, face, and respiratory system become weak, have difficulty moving, or may not function at all after a stroke or other brain injury. The type and severity of dysarthria depends on which area of the nervous system is affected. Some of the causes of dysarthria include stroke, head injury, cerebral palsy, and muscular dystrophy.[6] Arboix et al, (2000) [7] found that lacunar hemorrhagic stroke accounted for 3.8% of all cases of lacunar syndrome and 7.4% of all cases of intracerebral hemorrhage.[7] After multivariate analysis, only headache (OR 10.14), sudden onset (OR 9.89), and dysarthria (OR 0.10) were independent predictors of lacunar hemorrhagic stroke. Thus, the presence of headache and the sudden onset of symptoms and the absence of dysarthria may be useful signs to differentiate hemorrhagic lacunar stroke from other causes of lacunar stroke. [7] Atypical lacunar stroke (ALS) is a stroke subtype that rarely occurs in one in 14 lacunar strokes or occurs in 6.8% of lacunar strokes. After multivariate analysis, the variables of speech disturbance, nausea/vomiting, ischemic heart disease, and sensory symptoms were found to be significantly associated with ALS. Isolated dysarthria or dysarthria facial paresis is the most common form of presentation.[9]

When the ALS and other lacunar syndrome groups were compared, ischemic heart disease, speech impairment (dysarthria or aphasia), and vertebrobasilar artery involvement were significantly more common in the ALS group. From multivariate analysis, it was found that only speech disturbance (OR 9.1; 95% CI 3.9 - 21.0), nausea or vomiting (OR 8.3; 95% CI 2.2 - 30.3), ischemic heart disease (OR 2.8; 95% CI 1.2 – 6.5), and limb weakness (OR 0.12; 95% CI 0.06 – 0.25), appeared to be significant variables associated with ALS compared with the syndrome. other lacunar.[9] A recent report by Arboix et al (2017) [8] which reviewed the clinical features and risk factors for lacunar infarction in 864 patients over 24 years, found that lacunar infarcts represented 26.4% of all ischemic strokes. Many clinical conditions were independent factors of lacunar infarction including speech impairment with OR = 0.48 (95% CI 0.39-0.58, $p < 0.001$). From the description above, although it was carried out by the same Spanish group of researchers (Arboix et al.), the magnitude of the association of lacunar infarction with dysarthria speech disorders varied from OR=0.1 to OR=9.1. Due to limitations in understanding the pathophysiology underlying lacunar infarcts, while the development of new therapies for lacunar infarcts is slow, a study of the relationship between CT scan images of lacunar infarcts and speech disorders needs to be carried out as a screening method in patients with a stroke diagnosis.

METHOD

This research is an observational analytic study with a case-control type of research, namely by comparing the case group and control group based on their exposure status (retrospective) the direction of investigation, the design moves from effect (disease) to cause (exposure). Subjects were selected with a certain outcome (speech disorder) and then looked back (backward) on the research exposure status experienced by the subject (lacunar infarction). The data source comes from secondary data in the form of medical records at RSUPHAM Medan.

This research was conducted at the Haji Adam Malik General Hospital (RSUPHAM) Medan, after obtaining approval from the USU Medical Faculty research ethics committee. The population in this study were all medical records of stroke patients who went to the Department of Neurology at the Haji Adam Malik General Hospital (RSUPHAM) Medan for a period of one year from January 1, 2019 to December 31, 2019 who underwent a head CT scan. The sample is all medical records from the above population with a diagnosis of ischemic stroke and whether or not there is information about slurred speech that meets the inclusion and exclusion criteria.

The inclusion criteria of this study were the medical records of adult stroke patients (male and female), the results of a CT scan of the head without contrast and the results of a neurological examination about speech ability. Exclusion criteria in this study were medical records of patients with tongue anatomy disorders, had a history of being mute and 18 patients taking drugs that work in the central nervous system (CNS). The independent variable was lacunar infarction and the dependent variable was speech disorder (dysatria or slurred speech).

After obtaining approval from the research ethics commission, the medical records of patients diagnosed with ischemic stroke who underwent a head CT scan at the HAM Hospital during the period 1 January 2019 to 31 December 2019. Then recorded, whether there was lacunar infaq and the presence or absence of speech disorders from each notes in the medical record. Then this data was analyzed by chi-square test and the odds ratio was calculated. An analysis result is said to be statistically significant if the p value <0.05 is obtained. Univariate data (age, gender, hypertension, diabetes, obesity, smoking) were described in tabular form. Bivariate data (correlation of lacunar infarct and speech disorders (dysarthria or slurred speech) were analyzed by chi-square, then the odds ratio was calculated. In this study, the case group included the medical records of those with speech disorders and those included in the control group were medical records from who has no speech disorder.

RESULTS

This study is an observational analytic study with a case-control type of research with the aim of knowing the relationship between CT scan images of lacunar infarcts and dysarthria in ischemic stroke patients. Table 1 shows the relationship between lacunar infarction and the incidence of dysarthria.

Table 1. The relationship between lacunar infarct and the incidence of dysarthria

Lacunar infarction	Group						p value*
	Dysarthria		Non-dysarthria		Total		
Present	18	72.0%	18	72.0%	36	72.0%	1,000
Absent	7	28.0%	7	28.0%	14	28.0%	
Total	25	100.0%	25	100.0%	50	100.0%	

*chi square

In Table 1, after an assessment with the chi square test, the subjects on the CT scan results of lacunar infarction with dysarthria 18 people (72%), and 7 people (28%) on the CT scan results there is no lacunar infarction. The same number and percentage were also found in the non-chivalrous control group. The test results obtained p value = 1,000 and odd ratio = 1.00, in other words there is no significant relationship between lacunar infarct and dysarthria.

Regarding the demographic characteristics of the subjects, the subjects in this study were 50 patients with 25 dysarthria patients and 25 non-chivalrous patients who underwent a head CT Scan at the Radiology Installation of H. Adam Malik Hospital Medan. In this study, the distribution of the frequency of clinical variables according to knights (table 2) and according to lacunar infarcts (table 3) is presented.

Table 2 shows that there is no significant difference in the frequency distribution of clinical variables between the case (chivalry) and control (non-chivalrous) groups so that the two groups in this study deserve to be compared. The distribution of clinical variables according to the presence of lacunar infarction is shown in Table 3.

Table 2. Frequency distribution of research subjects based on characteristics

Characteristics	Dysartrhia		Non-dysarthria		Total		p-value
Gender							
• Male	14	56.0%	14	56.0%	28	56.0%	1,000
• Woman	11	44.0%	11	44.0%	22	44.0%	
Smoking status							
• Smoke	14	56.0%	14	56.0%	28	56.0%	1,000
• Do not smoke	11	44.0%	11	44.0%	22	44.0%	
DM history							
• Present	10	40.0%	11	44.0%	21	42.0%	1,000
• Absent	15	60.0%	14	56.0%	29	58.0%	
Hypertension							
• Present	16	64.0%	19	76.0%	35	70.0%	0.538
• Absent	9	36.0%	6	24.0%	15	30.0%	
Obesity							
• Present	16	64.0%	14	56.0%	30	60.0%	0.773
• Absent	9	36.0%	11	44.0%	20	40.0%	
Hypercholesterolemia							
• Present	18	72.0%	20	80.0%	38	76.0%	0.742
• Absent	7	28.0%	5	20.0%	12	24.0%	

In table 3 it can be seen that clinical variables according to the presence of lacunar infarction mostly occur in male sex 20 people (55.6%), smoking status 19 people (52.8%), history of no DM 19 people (52.8%), hypertension was 25 people (69.4%), obesity was 22 people (61.1%), and hypercholesterolemia was 25 people (69.4%).

Table 3. Distribution of clinical variables according to the presence of lacunar infarction

Variable	Lacunar infarction		Non lacunar infarction	
Gender				
• Male	20	55.6%	10	71.4%
• Woman	16	44.4%	4	28.5%
Smoking status				
• Smoke	19	52.8%	9	64.3%
• Do not smoke	17	47.2%	5	35.7%
DM history				
• Present	19	52.8%	10	71.4%
• Absent	17	47.2%	4	28.5%
Hypertension				
• Present	25	69.4%	10	71.4%
• Absent	11	30.5%	4	28.5%
Obesity				
• Present	22	61.1%	8	57.1%
• Absent	14	38.8%	6	42.8%
Hypercholesterolemia				
• Present	25	69.4%	13	92.9%
• Absent	11	30.5%	1	7.1%

DISCUSSION

In accordance with the aim of the study to determine the relationship between the presence of lacunar infarction and dysrhythmias, this study did not find a significant relationship (p = 1,000, OR = 1.00). Although this study did not find a significant relationship, several previous studies mentioned a significant relationship, such as the study conducted by Arboix et al (2017) [4] which examined the clinical features and risk factors for lacunar infarction in 864 patients for 24 years, found that lacunar infarction represented 26.4% of all

ischemic strokes. Many clinical conditions were independent factors of lacunar infarction including speech impairment with OR = 0.48 (95% CI 0.39-0.58, p < 0.001).

From the results of the demographic characteristics of 50 samples of this study, it was found that the number of men was 28 people (56%), a history of smoking was found 28 people (56%), a history of diabetes mellitus was found to be 21 people (42%), a history of hypertension was found to be 35 people (70 people). %), obesity was found in 30 people (60%), and hypercholesterolemia was found in 38 people (76%). Throughout the literature search, no literature has been found on the risk factors for the occurrence of dysentery in ischemic stroke patients. In other words, the findings presented in this study are the first to report on the risk factors for dysentery in ischemic stroke.

Although the incidence of knighthood is caused by other factors (gender, smoking, history of diabetes, hypertension, obesity and hypercholesterolemia) in addition to the presence or absence of lacunar infarction, the data obtained provide a question as to why the incidence of knighthood is not followed by a high percentage of diabetes. Until now there has been no writing explaining the relationship between diabetes and dysarthria. Supposedly if diabetes gets worse or blood sugar levels increase, it will be followed by blood thickening (Mushtaqa et al, 2019)[10] which in turn will slow down blood flow to the sick place as proven by Cinar et al, namely when blood glucose levels increase, blood viscosity also increases. followed by a decrease in blood flow rate and an increase in blood pressure.[11]

With lower blood sugar levels, the chances of being knighted should be minimal, this is the opposite of this research report. Many things can be involved in the occurrence of a knight, besides the blood flow is the location where the blood flow is disturbed. Where in this study the location of the lacunar infarct was not reported and not studied. According to Caplan (2015) [12], lacunar infarcts that occur in small arteries are usually the process of lipohyalinosis (fibronoids rather than the walls of the tunica intima). If the affected diameter is 0.001mm it is not affected in the middle cerebral artery (MCA). If it is not exposed to the MCA and the infarct is said to be 0.001mm, then there will be no symptoms of knighthood. From this information, it is true that dysarthria in diabetes still does not show a relationship, due to the pathophysiological process of lacunar infaq. If the lacunar infarct lesion is 0.001mm in diameter (eg due to embolism) then it is asymptomatic.

Of the 50 population with ischemic stroke, 72% had lacunar infarction. This value is much larger than the previous reports by Harris et al, 2018 [1] (45.07%) and Arboix et al, 2014 [13] (25%). Harris et al, 2018 [1] reported that 45% of the total ischemic stroke patients had lacunar infarction. Important risk factors associated with lacunar infarction are hypertension, hypercholesterolemia, diabetes and male population. Furthermore, Harris et al reported that the percentage of risk factors for lacunar infarction in Indonesia were as follows: hypertension (81.35%), diabetes (23.00%), hypercholesterolemia (15.96%) and smoking (28.62%). These risk factors did not differ between lacunar infarction and hemorrhagic stroke.[1] The figures presented by Harris et al appear to be different from those presented in this study. This is understandable, because Harris et al collected and analyzed data on 5411 patients from 18 hospitals spread throughout Indonesia, which treated various ethnic groups with various types of living habits.

From further analysis (table 4.3), in this study found the incidence of lacunar infarction in men (55.6%), smoking history (52.8%), history of diabetes (52.8%), hypertension (69.4%), obesity (61.1%), and hypercholesterolemia (69.4%). The results of this study are similar to the reports of previous researchers. The values found in this study are not much different from the values reported by Spanish researchers (Arboix et al., 2015) [14] namely hypertension (62.7%), diabetes mellitus (62.7%), hyperlipidemia (33.3%), obesity (13.7%) and smoking (45.1%), The prominent differences were in hypercholesterolemia (69.4% vs. 33.3%) and obesity (61.1% vs. 33.3%). This may be related to the differences in the lifestyle of the population in Indonesia and in Europe.

In another study conducted by Bejot et al (2008) [15] showed that the risk factors for hypertension (p 0.142), diabetes mellitus (p 0.218), and hypercholesterolemia (p 0.274) were not statistically significant.

From the study of the relationship of clinical factors with the incidence of lacunar infarction found obesity, length of hospital stay (> 12 days), hypertension, and age are independent significant variables

associated with lacunar stroke in women, while peripheral vascular disease, chronic obstructive pulmonary disease , renal dysfunction, and heavy smoking were independent variables for lacunar stroke in men without mentioning dysarthria as an independent variable for the incidence of lacunar stroke.[13]

From the following findings of these Spanish investigators, independent factors associated with acute lacunar stroke in patients aged >55 years were alcohol consumption (>60 g/day), heavy smoking (>20 cigarettes/day), obesity, hypertension, and headache at onset. stroke and not dysarthria.[14] From multivariate analysis, it was found that hypertension (odds ratio = 2.01) and diabetes (odds ratio = 1.62) were significant predictors of lacunar stroke recurrence, while hyperlipidemia was inversely related (odds ratio = 0.52).[8] After multivariate analysis, only headache, sudden onset, and dysarthria were independent predictors of lacunar hemorrhagic stroke.[7] In atypical lacunar syndrome, 74.4% dysarthria was found. The incidence of atypical lacunar syndrome is mainly due to small vessel disease (96%).

The limitation of this study was that it only wanted to determine the relationship between the presence or absence of lacunar infarction and the presence or absence of dysarthria. However, with the data on other clinical factors (gender, smoking, history of diabetes, hypertension, obesity and hypercholesterolemia) which gave the figures as not in line with estimates. This is all because these factors are not analyzed statistically. In addition, this study did not determine the location of lacunar infarction.

CONCLUSION

In this study, no significant relationship was found between the incidence of lacunar infarction and the incidence of dysarthria. The population with the most lacunar infarcts is men, hypertension, obesity, hypercholesterolemia, smoking and diabetes. Suggestions for doing the same research is better with total sampling.

DECLARATIONS

Ethics approval and consent to participate. Permission for this study was obtained from the Ethics Committee of Universitas Sumatera Utara and H. Adam Malik General Hospital..

CONSENT FOR PUBLICATION

The Authors agree to publication in Journal of Society Medicine.

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COMPETING INTERESTS

None.

AUTHORS' CONTRIBUTIONS

AA collects the data and writes the initial manuscript. ERD provided contribution and revision regarding the data analysis and imaging aspect of the discussion. KR provided contribution and revision regarding the data analysis and clinical aspect of the discussion. All authors read and approved the final manuscript.

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