CT SCAN IMAGES OF STROKE IN COVID 19 PATIENT DURING PANDEMIC

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ABSTRACT

Objectives: Neurological manifestation in Covid-19 patients can include anosmia, seizures, ataxia, headache, dizziness, muscle aches. Stroke is one of the complications that can be caused by Covid 19 infection. The mechanism that occurs in general, is caused by an increased hypercoagulopathy state, vasculitis, and direct invasion by the Covid 19 virus. This complication will increase the morbidity and mortality rates in patients with Covid 19. Head CT scan is the main tool for diagnosing stroke in emergency conditions, it can provide useful information during a pandemic, because it provides fast images and high accuracy. Understanding the shape and type of stroke will certainly help in reducing morbidity and mortality in stroke patients with Covid 19.

Method: This study is a descriptive observational retrospective study with a cross-sectional design from June 2020 to March 2022 in stroke patients with positive RT PCR who performed a head CT Scan at Unair Hospital Surabaya.

Result: Stroke patients with positive RT PCR were 70 patients. The highest incidence of stroke was stroke infarcts affecting small vessels, amounting to 58 (83%) cases, most in the basal ganglia area (24%) and cortica subcortical frontal lobe (24%), stroke affecting large vessels as many as 6 (8.5%) cases, with the most locations involving the Middle Cerebral Artery (MCA) (42.8%) and Posterior Cerebral Artery (PCA) (42.8%), hemorrhagic stroke 6 (8.5%) cases. The incidence of multiple area infarction was 39 (62%) cases, while single area was 24 (38%) cases.

Conclusion: Stroke in patients with Covid 19 mostly involved small vessels, followed by strokes affecting large vessel and hemorrhagic strokes.

Keywords: Covid 19, Stroke, Head CT Scan

Introduction

Stroke is a leading cause of death and disability in many countries. In 2013 globally there were 25.7 million stroke sufferers, 6.5 million deaths due to stroke, the highest mortality was in Asia, Indonesia there were 193.3 million deaths per 100 thousand people(1). Stroke patients with Covid 19 experienced an increase during the pandemic compared to stroke patients without Covid 19. The incidence of Non-Large ischemic stroke during the pandemic was 35%, while for hemorrhagic stroke it was relatively the same(2). The proportion of stroke events in Covid 19 patients is estimated to be 4.9%, with bleeding strokes being less(3).

Method

This study is a descriptive observational retrospective study with a cross-sectional design from June 2020 to March 2022 in stroke patients with positive RT PCR who performed a head CT scan at Unair Hospital Surabaya. Inclusion criteria included all stroke patients with positive RT-PCR examination who performed head CT scan. Exclusion criteria for Covid 19 patients with stroke who have normal features on CT scans. Head CT scan performed using a somatom 64 top seri 12012 Siemens. Data were obtained in the form digital raw. The results of the CT scan of the patient's head were analyzed by a neuroradiologist. Hemorrhagic stroke patients were grouped into 3 groups, group with volume < 30 ml, volume 30-60 ml, volume > 60 ml. The volume of bleeding is calculated based on the formula ABC/2 where A is the largest axial diameter, B: the diameter of the bleeding being pulled 90 degrees from line A, C; the craniocaudal diameter of the hemorrhage. Ischemic stroke patients are grouped into ischemic strokes caused by occlusion of large vessels and small vessels. Areas affected by stroke were grouped into single areas, and multiple areas with an area of < 4 cm2 and >4 cm2. Measurement of the day after tomorrow by calculating the largest dimension in the axial section.

Result

The number of stroke patients with Covid 19 studied was 70 patients, 28 (40%) women and 42 (60%) men. The average age was 60.76 +/- 14.9 years (table 1).

Table 1. Characteristics of the sample by age and sex.

Characteristics	Total sampel (n = 70)
Gender	
Man	42 (60)
Woman	28 (40)
Age	
< 50 years	12 (17.1)
> 50 years	58 (82,9)
Average	60,7 +/- 14,9

Most hemorrhagic strokes were in the frontal, parietal and temporal areas with the highest

volume < 30 ml (table 2).

Table 2. Hemorrhagic stroke (volume and location).

Haemoragic Stroke	Total
Volume	
< 30 ml	4 (66,7%)
> 30 ml	1 (16,7%)
> 60 ml	1 (16,7%)
Location	
Frontal, parietal, temporal lobe	4 (66,7%)
IVH	1 (16,7%)
Cerebellum	1 (16,7%)

Distribution of ischemic stroke locations on small vessels and large vessels. with most areas in

the basal ganglia and cortical subcortical frontal lobes (Table 3).

Table 3. Distribution of ischemic stroke in small and large vessels

Ischemic Stroke	Total
Small Vessel	
Basal ganglia	12 (24%)
Cortical subcortical frontal lobe	12 (24%)
Pons and medulla	11 (22%)
Internal capsule	10 (20%)
Corona radiata	6 (12%)
Thalamus	5 (10%)
External capsule	4 (8,0%)
Insular Cortex	3 (6,0%)
Cortical subcortical parietal lobe	1 (2,0%)
Centrum semiovale `	1 (2,0%)
Large Vessel	

Middle Cerebral Artery	3 (42,8%)
Posterior Cerebral Artery	3 (42,8%)
Anterior Cerebral Artery	1 (14,4%)

Multiple infarct areas were more dominant than single areas, with more than 4 cm infarct area (table 3).

Table 3. Number and area of infarction

Number and area of infarction	Total
Number of Infarct Area	
Single	24 (38%)
multiple	39 (62%)
Infarct size	
< 4 cm2	44 (62%)
> 4 cm2	19 (38%)

Discussion

Gender and age are non-modifiable risk factors for stroke. The data obtained by the male sex has a greater number, namely 66 (57.9%) while the female sex is 48 (42.1%), from previous studies it is stated that at middle age the male gender has a greater risk of women (4). In terms of age, the dominant result was age > 50 years 58 (82.5%) with an average age of 60.7 +/- 14.9 years.

The incidence of hemorrhagic stroke is very rare, with a high mortality rate in Covid-19 patients(5). In this study, there were 6 (8.5%) cases out of a total of 70 cases. Volume < 30 ml in 4 (66.7%) cases. Bleeding volume < 30 ml has a 30-day mortality rate of 19%, while volumes > 60 ml are 93%(6)The causes of hemorrhagic stroke in Covid 19 patients are coagulopathy such as DIC, thrombocytonia, increased D-Dimer, prolongation of the prothrombin time which can cause bleeding. Another cause could be the attachment of SARS-CoV-2 to the ACE2 receptor, which is an important component of regulating the RAS pathway in controlling blood pressure. The presence of this attachment causes the ACE2 receptor to experience decreased function resulting in vasoconstriction and dysregulation of cerebral autoregulation which in turn causes bleeding complications (7).

Ischemic strokes affecting small vessels are mostly located in the basal ganglia and cortical subcortical frontal lobe 12 (24%), followed by the pons and medulla 11 (22%), internal capsule 10 (20%), Corona radiata 6 (12%), thalamus 5 (10%), external capsule 4 (8%), cortexinsular 3 (6%), cortical subcortical parietal lobe and centrum semiovale 1 (2%). Ischemic stroke in Covid-19 patients can be caused by the degree of hypercoagulopathy, vasculitis, and

cardiomyopathy. In large vessels, the majority of the MCA and PCA were 3 cases (42.8%), and 1 case (14.4%) for the ACA. Research conducted by Mendes et al in the elderly group with Covid 19 stroke characteristics of stroke affecting large vessels the most in MCA (55.5%) and followed by PCA (3/9).(8). In this study, the incidence of stroke was dominated by multiple area infarction 39 (62%) with an infarct area of < 4 cm2 (44%). This is in line with the research conducted by Katz et al which stated that stroke patients with Covid 19 had multivascular territory followed by single vascular and solitary small vessel occlusion. Covid 19 is an independent risk factor in patients hospitalized (9).

The limitation of the study is the incidence of stroke in patients with Covid 19 which resulted in a small number of samples. This study only took from one center.

Conclusion

Stroke cases in Covid-19 sufferers are more in the form of ischemic strokes compared to bleeding strokes. There are fewer strokes on large vessels compared to strokes on small vessels. Stroke infarct in Covid 19 is dominant in multiple areas.

Conflict of Interest

Nil

Abbreviations :

RT PCR : Reverse Transcription Polymerase Chain Reaction; IVH : Intraventricular hemorrhage; MCA : Middle Cerebral Artery; PCA : Posterior Cerebral Artery; ACA : Anterior Cerebral Artery

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