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CHARACTERISTICS OF INTRACEREBRAL HEMORRHAGE AT DR.KARIADI GENERAL HOSPITAL: A SERIAL CASE

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ABSTRACT

Background: Stroke is an acute neurological deficit caused by sudden or rapid disruption of blood circulation to the brain. Intracerebral hemorrhage is the subtype of stroke with the highest mortality and disability rate. Several risk factors may be related to the clinical outcome of intracerebral hemorrhage. Herewith we present a case series regarding the characteristics of intracerebral hemorrhage. **Methods:** A case series among three intracerebral hemorrhage cases in January - February 2024 at Dr. Kariadi Hospital. Epidemiological, and clinical data were recorded and reported. **Case Presentations:** Three cases were studied, the main complaint of the patient was decreased consciousness. These patients had different risk factors for stroke. According to the Siriraj score, NIHSS score, and neuroimaging findings, these patients had hemorrhagic strokes with different brain lesions. Two-thirds of the patients had uncontrolled hypertension and one patient was accompanied by uncontrolled diabetes mellitus**. Conclusion:** Overall, all patients were >45 years old and the risk factors of these patients were modified risk factors that is uncontrolled hypertension and diabetes mellitus over a long period resulting in ganglionic hemorrhage.

INTRODUCTION

A stroke is a brain attack due to disruption of the supply of blood to the brain resulting from blockage of a blood clot or hemorrhage resulting in the decrease of oxygen and nutrient supply to the brain, leading to damage of brain tissue resulting in the rapid onset of symptoms and signs corresponding to the affected focal area. [1]

Stroke is divided into two types. The first type is ischemic stroke, caused by insufficient blood supply to the brain due to narrowing or blockage of blood vessels leading to ischemia in brain tissue. The second type is hemorrhagic stroke, caused by the rupture of aneurysms in the brain parenchyma or the space between the brain and the skull, resulting in ischemia and pressure on brain tissue. [2] Many factors can influence the occurrence of stroke, including age, genetics, race, hypertension, dyslipidemia, diabetes mellitus, smoking, atherosclerosis, heart disease, obesity, alcohol consumption, stress, socioeconomic conditions, supportive environments, poor diet, insufficient physical activity, and the use of contraceptive pills. However, among these factors, only hypertension significantly affects the occurrence of stroke, while lipid levels and smoking habits are not significantly associated with stroke occurrence. [3]

Stroke is the third leading cause of death in the United States. In Indonesia, the proportion of deaths due to non-communicable diseases increased from 41.7% in 1995 to 49.9% in 2001 and then reached 59.5% in 2007. Stroke became the leading cause of death, accounting for 15.4%, followed by hypertension, diabetes, cancer, and chronic obstructive pulmonary disease. [4] In Indonesia, it is

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estimated that every year about 500,000 people suffer from a stroke, with approximately 2.5% of the 500,000 patients or 125,000 individuals succumbing to it, while the remainder suffer from mild to severe disabilities. Generally, the incidence rate of stroke is approximately 200 per 100,000 people. This means that in one year, among 100,000 people, 200 individuals will experience a stroke. [3] Every year, 10 million people worldwide suffer from a stroke. Among this number, approximately 5 million people die, while another 5 million experience permanent disabilities that require assistance with daily activities (WHO). In 2021, 1 in 6 deaths from cardiovascular disease was due to stroke. Additionally, every year, more than 795,000 people in the United States experience a stroke, with about 610,000 of them having a first or new stroke. [5,6]

This case series provides an overview of intracerebral hemorrhage. By outlining the definition, types, risk factors, and epidemiological data associated with stroke, this series aims to increase awareness and understanding of the condition among healthcare professionals and the general public.

METHODS

This study is a case series obtained from RSUP Dr. Kariadi Semarang Indonesia, among three cases of intracerebral hemorrhage (ICH). A thorough review of the medical records database was performed to identify the demographical charactersistics, risk factors and the severity as well the clinical and other investigations. Data collection involved retrieving demographic information such as age, gender, and medical history and documenting clinical features at presentation, including neurological deficits and associated comorbidities. Neuroimaging characteristics such as location of bleeding, volume, and presence of any related complications were also meticulously recorded.

CASE REPORTS

Case 1

A 51-year-old man presented with a sudden onset of headache followed by decreased consciousness headache accompanied by vomiting and limb weakness. The patient had a history of hypertension, with no history of diabetes mellitus or trauma.

On examination, GCS was E3M3Vaphasia, blood pressure was 154/101 mmHg, heart rate 87 beats per minute, respiratory rate 20 breaths per minute, and body temperature of 36.5°C. The neurological examination revealed the right facial palsy, right motoric lateralization, and increased deep tendon reflexes in the right extremities with no pathological reflexes.

MSCT of the brain showed ± 29.63 ml intracerebral hemorrhage in the left corona radiata, external capsule, and basal ganglia accompanied by intraventricular hemorrhage and signs of increased intracranial pressure.

The patient received therapy with oxygen, fluids, anti-hypertension, tranexamic acid, and vitamin B12. Routine clinical monitoring was done. After treatment and care for 12 days, the patient was able to be discharged with blood pressure before going home of 115/80 mmHg. The patient's consciousness has improved with GCS E4M4Vaphasia, physiological reflexes have returned to normal, and right facial weakness has disappeared but there is still weakness in the right limb which has improved more than when he was admitted to the hospital.

Case 2

A 48-year-old woman suddenly experienced loss of consciousness before severe headache followed by weakness of the left lower extremities, and vomiting. The patient has a history of uncontrolled hypertension on medication with no history of diabetes mellitus or trauma. No other family members reported similar complaints.

Physical examination revealed blood pressure was 168/75 mmHg, heart rate of 89 beats per minute, respiratory rate of 20 breaths per minute, and body temperature of 36.3°C. neurological examination demonstrated that the patient had left central type facial palsy, left lingual palsy, and left motoric lateralization with brisk deep tendon reflexes on the left side and no pathologic reflexes.

Non-contrast head MSCT revealed intracerebral hemorrhage in the right lentiform right thalamus, and right temporal lobe, accompanied by perifocal edema, with a volume of approximately 11.97 ml resulting in the increased intracranial pressure.

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The patient's treatment regimen included oxygen therapy at 3 liters per minute, lactated Ringer's solution at 20 drops per minute, intravenous mannitol fluid therapy at 175 ml every 6 hours, intravenous nicardipine with an initial dose of 0.5 mcg/kg, intravenous vitamin B12 at 500 mcg every 12 hours, oral paracetamol at 500 mg every 8 hours, and intravenous ranitidine 50 mg every 12 hours. After treatment and care for 12 days, the patient can be discharged from the hospital with the condition that the patient is conscious, has eye contact, good communication (+) orientation, and can follow commands but still has weakness in the left limb, with muscle strength of 555/111 555/222.

Case 3

A 53-year-old man was referred because of the sudden onset of loss of consciousness accompanied by weakness in the left limbs, lips drooping to the right, and headache. The patient had a history of uncontrolled hypertension and uncontrolled diabetes mellitus with no history of prior stroke and head trauma.

From the physical examination, GCS was E3M5V4, blood pressure 145/92 mmHg, heart rate of 73 beats per minute, respiratory rate of 26 breaths per minute, and body temperature of 36.8°C. Neurological examination revealed that there was left central type facial palsy, left lingual palsy, and left-sided hemiplegia with muscle strength of 444/111// 444/111, brisk deep tendon reflexes, and the presence of Babinski sign on the left leg.

Non-contrast head MSCT revealed intracerebral hemorrhage in the corona radiata, lentiform nucleus, posterior limb of the internal capsule, thalamus, and right external capsule, accompanied by perifocal edema, with a volume of approximately 92.69 ml, furthermore, intraventricular and subarachnoid hemorrhage were observed resulted in the increased intracranial pressure.

The patient's treatment regimen included oxygen therapy at 3 liters per minute, lactated Ringer's solution at 20 drops per minute, intravenous mannitol fluid therapy at 125 ml every 6 hours, intravenous nicardipine with an initial dose of 0.5 mcg/kg, intravenous vitamin B12 at 500 mcg every 12 hours, intravenous omeprazole at 40 mg every 12 hours, oral paracetamol at 500 mg every 8 hours, and oral amlodipine at 10 mg per 24 hours. After treatment for 3 days, the patient died due to cardiac arrest after 48 hours after craniotomy surgery.

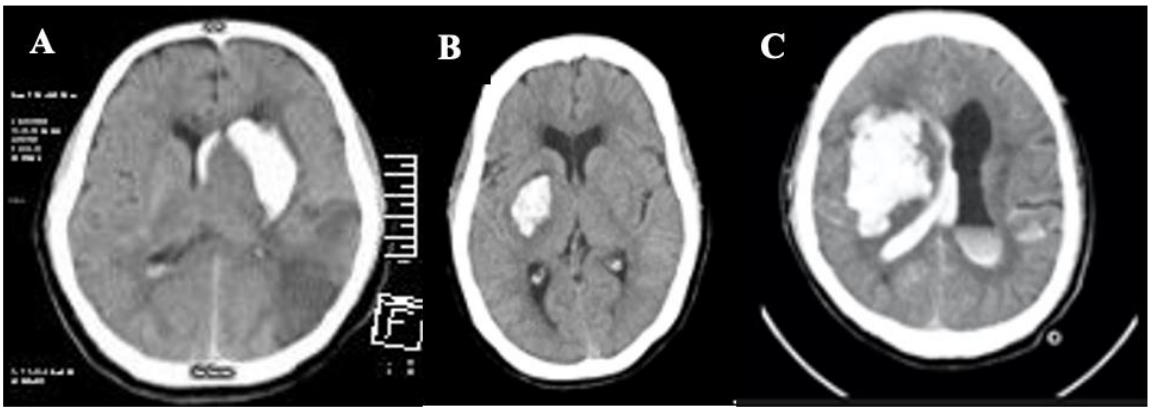

Figure 1. Head Non-Contrast MSCT Findings, A. Case 1, B. Case 2, C. Case 3

DISCUSSION

Intracerebral hemorrhage (ICH), a particular kind of stroke, occurs when a blood clot develops inside the brain tissue, sometimes extending into the ventricles. ICH accounts for 10-15% of all stroke cases and carries a high risk of disability and death. [7] In all cases, patients presented with headaches and a sudden decrease in consciousness. Previous studies show that a loss of consciousness occurs more frequently in individuals with intracerebral hemorrhage than in those with ischemic stroke. This difference is due to the increase in the intracranial

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pressure and causing compression of vital brain structures such as the thalamus and medulla. While both ischemic and hemorrhagic strokes can cause headaches, individuals suffering from hemorrhagic strokes often report experiencing sudden, intense headaches, which could be described as the "worst headache of my life".[8]

We demonstrated three cases with a diagnosis of ICH. The occurrence of ICH is dependent on risk factors such as chronic hypertension, aneurysms or vascular malformations, blood-thinning medications, such as anticoagulants or antiplatelet drugs, amyloid angiopathy, age, and smoking. Table 1 shows the demographic characteristics of cases. From Table 1, it can be concluded that in our data, the incidence of ICH is higher in males compared to females and in all cases, hypertension was found to be a risk factor. In all cases, the patients were within the middle-aged adult range. This aligns with previous research indicating that hypertension is the most common risk factor for ICH. Incidence of ICH was also found higher in men than in women according to previous research, it is generally affected by social pressure, dietary habits, genes, and multiple other factors. Previous research also stated that ICH predominantly affects middle-aged and older adults, and is uncommon in individuals younger than 45 years. [9]

The risk of developing ICH increases as a person gets older as age could elevate the risk of chronic health conditions and systemic illnesses like hypertension, diabetes, and atrial fibrillation which may play a role in the development of ICH. [10] Among all risk factors, hypertension is the most dominant risk factor, with the yearly incidence rate among those with hypertension being 28 per 100,000 individuals. This figure is remarkably close to the overall yearly incidence rate of ICH, which stands at 29.9 per 100,000 people. Additionally, other factors such as diabetes, the use of antiplatelet and anticoagulant medications, high cholesterol, smoking, and heavy alcohol use also significantly contribute to the risk of developing ICH. In all discussed cases, all patients also had hypertension, which is the most common risk factor in ICH. [9]

Table 1 Demographic Characteristics of Cases

Case No.	Age	Gender	Risk factors
1	51	Male	Old age, Hypertension
2	48	Female	Old age, Hypertension,
3	53	Male	Old age, hypertension, diabetes mellitus

A retrospective cohort study in the Netherlands, utilizing an inpatient database, revealed findings regarding the incidence of ICH. According to the study, the occurrence of ICH per 100,000 individuals was notably distinct across age groups: 5.9 in the 35-54 age bracket, 37.2 in the 55-74 age group, and significantly higher at 176.3 in individuals aged 75-94 years, as of 2010. However, it's noteworthy that all patients in our case fall below the age of 54. This demographic characteristic sets our patients apart and places them within a relatively smaller population subset compared to the age distributions typically associated with higher incidences of ICH. [11]

Undetected and uncontrolled hypertension is one of the major risk factors for stroke all over the world. Stiffening of the large arteries can be induced by aging. This will cause a rise in the systolic blood pressure and a decrease in the diastolic blood pressure. In an aging population, elevated systolic blood pressure is responsible for most cases of uncontrolled hypertension. In all three cases, aging and a history of uncontrolled hypertension were found. Increases in stiffness and elevation in blood pressure were associated with an increased risk of stroke. High blood pressure will strain blood vessels. If the blood vessels can no longer hold up the pressure, over time they will rupture and cause hemorrhagic stroke. [12]

There is a difference in the clinical condition of the third patient, marked by the presence of an atheroma marker in the form of diabetes mellitus. Glucose levels in diabetic patients with hemorrhagic stroke compared to non-diabetic patients, who suffer from hemorrhagic stroke are higher and will increase the risk of death in hemorrhagic stroke patients. The occurrence of hyperglycemia causes damage to the walls of large blood vessels and peripheral blood vessels. [13]

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Hyperglycemia can also increase blood viscosity which will then cause an increase in blood pressure or hypertension and result in stroke. In a study conducted by Tawhid et al, it was explained that there was a significant relationship between hemorrhagic stroke and diabetes mellitus (p-value = 0.006). [14]

Table 2 Clinical Features of Cases

Case No.	Onset	Loss of consciousness	Vomiting	Headache	Atheroma marker	Siriraj Score	Admission NIHSS Score	Location of Hemorrhage	Outcome NIHSS Score
1.	2 days	+	+	+	-	1.6	18	Basal Ganglia and Internal Capsule	12
2.	2 hours	+	+	+	-	2	13	Basal Ganglia and Internal Capsule	8
3.	4 hours	+	+	+	+	1.3	23	Basal Ganglia and Internal Capsule	Death

Table 2 provides information regarding the clinical features of cases. Based on Table 2, it is found that with a variety of onset of ICH, our cases presented with the common symptoms including vomiting, headache, and decrease of consciousness. Siriraj score on our cases was more than 1 indicating the possibility of ICH, and the National Institute of Health Stroke Scale (NIHSS) scored above 10 on the first visit. The location of the hemorrhage in our cases was in the basal ganglia and internal capsule.

Previous studies stated that on average patients were taken to the hospital 8 hours after symptoms appeared to prevent severity and get quick treatment. [15] Unfortunately, there was a delay in coming to the emergency room on this first case.

Based on the Siriraj score, it was found that the score is higher than 1, which is in line with the previous study, indicating that there was supratentorial intracerebral hemorrhage, and proven by the result of a head CT scan. [16]

The severity of symptoms at the time of admission to a health facility is related to the initial symptoms of ICH. Symptoms observed include severe headaches, decreased consciousness, and neurological deficits depending on the location of ICH including weakness or numbness on one side of the body (hemiparesis or hemiplegia), difficulty speaking (aphasia), vision changes, nausea, and vomiting. [15]

There is a relationship between ICH volume and severity. The baseline NIHSS neurologic deficit severity score correlated strongly with baseline ICH hematoma volume. A study conducted by Farooq, it was revealed that there was a strong correlation between the NIHSS score and ICH volume r = 0.77 (p <0.001), and an increase in ICH volume of 10 cc would increase the NIHSS score by 4.5 points. [17] In another study conducted by Panchal, 39 patients were found to have a hematoma < 30 mL (56% survived), while 11 patients were found to have a volume > 30 mL (only 10% survived) explaining the higher mortality rate as the hematoma volume increases. [18]

The clinical presentations vary by the size and location of ICH. Based on a previous study, the most common site of ICH is the putamen with clinical presentations including rapidly progressive contralateral hemiparesis or hemiplegia with less severe contralateral hemisensory loss with the common symptoms including headaches, vomiting due to the increased intracranial pressure, and decreased level of consciousness because of the compression of the thalamus and brainstem resulted from high intracranial pressure. Higher cortical dysfunction such as aphasia, neglect, and hemianopia may present in lobar hemorrhages. [8]

If ICH extends within the brain tissue, due to factors such as ongoing bleeding, increased intracranial pressure, and disruption of nearby blood vessels, it can lead to further complications, including the involvement of additional brain structures and potentially intraventricular hemorrhage (IVH), occurring in approximately 40% of patients with ICH. It is uncommon to find IVH in the absence of ICH, present in less than 3% of cases. Recent studies have shown that IVH is a predictor of poor outcomes after ICH. [19]

Regarding the initial treatment, intravenous short-acting anti-hypertensive drugs can be used for controlling crisis hypertension, facilitating rapid reduction of blood pressure to prevent further

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bleeding. Parenteral antihypertensive agents suitable for this purpose include beta-blockers (such as labetalol and esmolol) and calcium channel blockers (like nicardipine and diltiazem), administered intravenously. According to the therapeutic algorithm, initial treatment for lowering blood pressure in patients with hemorrhagic stroke recommends intravenous monotherapy with nicardipine. This choice is favored due to nicardipine's swift onset and brief half-life, enabling a significant blood pressure decrease within 1-5 minutes. The initial dose given is 5 mg/hour intravenously, which can be increased by 2.5 mg/hour every 5-15 minutes, with a maximum dose of 15 mg/hour while monitoring blood pressure every 5 minutes. [20]

At the time the patient is admitted to the hospital, ICH volume and Glasgow Coma Scale (GCS) are the strongest predictors of 30-day mortality and can determine the patient's prognosis. Mortality rates are higher in cases of hemispheric lesions exceeding 30 cm^3. Patients with a GCS of less than 9 and lesion volumes greater than 60 mL have a mortality rate of 90%. Involvement of intraventricular hemorrhage with hydrocephalus is estimated to increase mortality by 43% within 30 days.[21]

In our study, the mortality rate for cases 1 and 2 was lower than case 3, because case 3 had a lesion volume > 60 mL (92.69 ml) so the mortality rate was 90% and the patient in case 3 died after craniotomy surgery.

A limitation of this study is that it is difficult to determine the time relationship between exposure and health impacts, it is not always clear whether exposure preceded the impact so a more detailed patient history is needed. Primary injury after intracerebral hemorrhage is time sensitive. Meanwhile it is difficult to pinpoint the exact timing of exposure to potential risk factors because ICH often occurs suddenly and unexpectedly. Furthermore, the deterioration in intracerebral hemorrhage (ICH) is attributed to factors such as hematoma expansion, intraventricular hemorrhage, perihematomal edema, and inflammation. Hematoma enlargement occurs within a span of three hours. Failure to stop the expansion of the hematoma can occur due to delayed treatment. Perihematomal edema, on the other hand, escalates within a day, reaching its peak approximately five to six days post-incident and persisting for up to two weeks. Surrounding the hematoma, there is an area of reduced blood flow. [22]

Some opinions said that ICH, like other ischemic diseases, is a medical emergency and treatment aimed at reducing blood pressure, reversing coagulopathy, or stopping bleeding should be initiated as early as possible after the onset of ICH. However, there is a need to emphasize that urgency in diagnosing and triaging ICH is essential. As with acute ischemic stroke, time is of the essence in the effective management of ICH. The pre-hospital/hospital ICH care system should have the same time demands as ischemic stroke. In addition, it is necessary to explore the patient's medical history in detail to determine the onset and development of symptoms, as well as assess the patient's risk factors and prognosis. [23]

CONCLUSION

In summary, Our study revealed that ICH occurred in patients with age over 45 years old with uncontrolled hypertension. The common symptoms in our cases were headache, vomiting and decrease of consciousness with the severity index were varies depend on the volume and location of ICH affecting the clinical outcomes.

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