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Intracerebral Hemorrhage-Grading Scale (ICH-GS) Score as a Prognosis Prediction of Spontaneous Intracerebral Hemorrhage at Rumah Sakit Islam Surabaya Jemursari

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Intracerebral Hemorrhage-Grading Scale (ICH-GS) Score as a Prognosis Prediction of Spontaneous Intracerebral Hemorrhage at Rumah Sakit Islam Surabaya Jemursari

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ABSTRACT

Background: Spontaneous intracerebral hemorrhage or hemorrhagic stroke is one of the leading causes of mortality and disability in Indonesia, but until now there is no specific therapy for this disease. The intracerebral hemorrhage (ICH) score is a widely used predictive tool for the prognosis of death 30 days after spontaneous intracerebral hemorrhage, but the intracerebral hemorrhage-grading scale (ICH-GS) score has a more specific interval to assess the prediction of the prognosis after intracerebral hemorrhage. Rumah Sakit Islam (RSI) Jemursari Surabaya has not carried out data collection related to the ICH-GS score with the outcome (death) of patients with spontaneous intracerebral hemorrhage, especially while still receiving hospital treatment.
Objective: To identify the number of ICH-GS scores in patients with spontaneous intracerebral hemorrhage as a predictor of prognosis at RSI Jemursari Surabaya.
Method: The type of this research is retrospective research. The population comprised of all patients with spontaneous intracerebral hemorrhage hospitalized at RSI Jemursari Surabaya in 2017-2019, with affordable population of all patients with spontaneous intracerebral hemorrhage diagnosed by a neurologist.
Results: The data showed that 5.5% (6 people) had an ICH-GS score of 5; 38.2% (42 people) had an ICG-GS score of 6; 21.8% (24 people) had an ICH-GS score of 7; 20 % (22 people) had an ICH-GS score of 8; 5.5% (6 people) had an ICH-GS score of 9; 4.5% (5 people) had an ICH-GS score of 10; 3.6% (4 people) had an ICH-GS score of 11; and 0.9% (1 patient) had an ICH-GS score of 12.
Conclusions: The results of the ICH-GS score can be used to facilitate communication both with fellow health workers and with the patient's family. Trend of the data showed that ICH-GS score is not consistent in showing the prognosis of spontaneous intracerebral hemorrhage (the smaller the ICH-GS score should have better prognosis than the higher score), while the information based only on volume and location can predict the prognosis more consistently`.

Introduction

Stroke is said to be a catastrophic disease because it has a broad impact on the economy and society. The 2018 Basic Health Research (Riskesdas) stated that the prevalence of stroke was 10.9 per mile with the highest prevalence in East Kalimantan Province (14.7 per mile) and the lowest in Papua Province (4.1 per mile). Data from the Healthcare and Social Security Agency

(BPJS) in 2016 showed that stroke cost health care costs of 1.43 trillion rupiahs. Data from the same source in 2017 showed an increase to 2.18 trillion rupiahs and it reached 2.56 trillion rupiahs in 2018 (Ministry of Health, 2019).

Stroke is a disease that affects the arteries leading to and within the brain. A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or ruptured blood vessels which result in the brain not being able to get the oxygen and nutrients it needs so that the brain cells die (ASA, 2021).

Data from the Indonesia Stroke Registry in 2012-2013 showed 20.3% of deaths in the first 48 hours after stroke (Anindhita and Wiratman, 2014, pp. 452). Stroke is the number 1 cause of death in Indonesia (Sulistyowati, 2017). In the United States, stroke is the 5th leading cause of death and the most common cause of disability (ASA, 2021).

At least 1 in 5 cases of stroke is related to obesity, 1 in 10 cases is related to smoking, 1 in 4 cases is due to insufficient consumption of fruits and vegetables, and 1 million cases are related to excessive alcohol consumption. There are >50% of stroke cases related to high blood pressure, 1 in 4 cases is related to high LDL levels, and 9% of cases occur due to irregular heart rhythms (Sulistyowati, 2017).

A stroke can be caused by a clot that blocks the blood flow to the brain (ischemic stroke) or by a ruptured blood vessels that block the blood flow to the brain (hemorrhagic stroke) (ASA, 2021). There are 2 types of hemorrhagic stroke, namely intracerebral hemorrhage or subarachnoid hemorrhage (ASA, 2021). Hemorrhagic stroke occurs in 10-15% of stroke cases, with an incidence rate of 24.6 per hundred thousand people each year (Ziawi and Carhuapoma, 2018).

Although the data suggest that stroke has an economic burden and a high mortality rate, intracerebral hemorrhage still has no specific therapy. The financial impact of intracerebral hemorrhage that has been highlighted is that although patients have a long stay in the intensive care unit, intracerebral hemorrhage still has a high mortality after 30 days of bleeding. If the patient survives, severe disability can occur (Ziawi and Carhuapoma, 2018).

Accurate prediction of intracerebral hemorrhage outcome is important in distinguishing patients who require special care or who might receive the benefits from a particular therapeutic strategy. Several scales for predicting mortality due to intracerebral hemorrhage have been developed, suggesting that the intracerebral hemorrhage (ICH) score is the mostreliable scoring system for predicting 30- day mortality in different populations and

clinical settings; yet mortality during hospitalization is also required. Therefore, the intracerebral hemorrhage-grading scale score (ICH-GS score) is calculated for prediction of outcome after intracerebral hemorrhage based on evaluations performed at the time the patient came to the hospital (Sandoval et. al., 2006).

Rumah Sakit Islam (RSI) Jemursari Surabaya is the only type B hospital in Wonocolo District, Surabaya. The researcher has conducted a research on the profile of patients with hemorrhagic stroke before conducting this study, and found that there were no records of ICH score or ICH-GS score in the patient's medical records and there were problems with telephone numbers that could no longer be contacted when the researcher would contact the numbers listed in the medical records. The existence of the 2019 corona virus (COVID-19) pandemic did not allow the researcher to visit the addresses listed in the medical records so that the observation of the ICH-GS score was only based on the data obtained when the patients were hospitalized. The existence of research on the ICH-GS score as a predictor of the prognosis of intracerebral hemorrhage can help health workers to be alert and bridge communication between health workers or between health workers and patients' families in the management of intracerebral hemorrhage.

Objective

To identify the number of ICH-GS scores in patients with spontaneous intracerebral hemorrhage as a predictor of prognosis at RSI Jemursari Surabaya.

For specific objective is to identify the characteristics of patients with spontaneous intracerebral hemorrhage at RSI Jemursari Surabaya based on theGlasgow Coma Scale, age, bleeding volume via head computed tomography (CT), location (infratentorial/supratentorial), and the presence or absence of intraventricular hemorrhage.

Significance of Research

Theorical significance of this research is to identify the characteristics of patients with spontaneous intracerebral hemorrhage at RSI Jemursari Surabaya. Practical significance of this research is to make the results of this study as a communication facilitator usage, both with fellow health workers and with the patient's family.

Methods

The type of this research is retrospective research. The population comprised of all patients with spontaneous intracerebral hemorrhage hospitalized at RSI Jemursari Surabaya in 2017-2019, with affordable population of all patients with

spontaneous intracerebral hemorrhage diagnosed by a neurologist. The data that have been collected were entered into the Statistical Package for the Social Sciences (SPSS) version 20.0 data format (SPSS, Inc., Chicago, Illinois).

Theoretical Review

Spontaneous intracerebral hemorrhage

Stroke is a major neurological disease in adulthood. Stroke describes an event that occurs acutely or suddenly. Based on the pathology, stroke is divided into ischemic stroke and hemorrhagic stroke. Hemorrhagic stroke is also known as spontaneous intracerebral hemorrhage. This type of stroke occurs due to the rupture of an intracerebral blood vessel which causes neurological symptoms that occur suddenly and is often followed by symptoms due to the effects of space compression or increased intracranial pressure. The effect of space compression or increased intracranial pressure causes the mortality rate in spontaneous intracerebral hemorrhage to be higher than in ischemic stroke (Anindhita and Wiratman, 2014, pp. 514).

Stroke is the 5th leading cause of death in the United States and the leading cause of disability. Spontaneous intracerebral hemorrhage accounts for 10% of the 800,000 strokes that occur in the United States each year (ASA, 2021).

This percentage increased in Japan, namely 18% and in Korea 24%. The incidence of spontaneous intracerebral hemorrhage is increasing in low and middle income countries, and Asia. Spontaneous intracerebral hemorrhage is more common in males and increases by age. The fatality of this disease is 25-30% in low and middle income countries (Unnithan et. al., 2020).

The pathophysiology of spontaneous intracerebral hemorrhage is generally preceded by damage to the walls of small blood vessels in the brain due to hypertension. Chronic hypertension causes aneurysms to form in small blood vessels in the brain. The process of turbulence of blood flow results in the formation of fibrinoid necrosis, namely cell/tissue necrosis with the accumulation of fibrin matrix. Herniation of the arteriolar wall and tearing of the tunica intima to form a microaneurysm (Charcot-Bouchard) also happen. This Charcot-Bouchard aneurysm can rupture immediately if the arterial blood pressure increases suddenly. In addition, chronic hypertension can cause a disturbance in the autoregulatory system of cerebral blood vessels due to the hyalinization process in the blood vessels so that the blood vessels lose elasticity. This condition causes the blood vessels of the brain to be unable to adjust to fluctuations in systemic blood pressure; a sudden increase in blood pressure can cause blood

vessels to rupture. The blood that comes out will accumulate and form a blood clot (hematoma) in the brain parenchyma. The volume of the hematoma will increase, generally within 24-48 hours of onset, causing a space compression effect that compresses the brain parenchyma and causes an increase in intracranial pressure (Anindhita and Wiratman, 2014, pp. 515-516).

Intraventricular hemorrhage may be secondary to spontaneous intracerebral hemorrhage, generally originating from the anterior communicating artery with blood entering the 3rd and 4th ventricles via the lamina terminalis. Bleeding in the 3rd ventricle but not in the lateral ventricles is an indication of basilar artery rupture. Blood filling in the 4th ventricle and a little in the 3rd ventricle can be suspected of coming from the posterior inferior cerebellar artery (Anindhita and Wiratman, 2014, pp. 535-536).

Intracerebral Hemorrhage-Grading Scale (ICH-GS) Scores

The ICH-GS score uses 5 points for prognostic evaluation of intracerebral hemorrhage. The components are age, Glasgow Coma Scale score at hospital admission, location of intracerebral hemorrhage, volume of intracerebral hemorrhage, and the presence or absence of expansion of bleeding into the ventricles (Sandoval et. al., 2007).

Table 1. ICH-GS Score

Component	Intracerebral Hemorrhage Point
Age, years old	
<45	1
45-64	2
≥65	3
Glasgow Coma Scale score	
13-15	1
9-12	2
3-8	3
Location of intracerebral hemorrhage	
Supratentorial	1
Infratentorial	2
Volume of intracerebral hemorrhage, mL	
Location of hemorrhage in supratentorial	
<40	1
40-70	2
>70	3
Location of hemorrhage in infratentorial	

<10	1
10-20	2
>20	3
Expansion of bleeding into the ventricles	
No	1
Yes	2
Total ICH-GS score	5-13

Glasgow Coma Scale score was taken on the arrival at the emergency department, volume of intracerebral hemorrhage was counted using the ABC/2 method, and the presence or the absence of intraventricular hemorrhage was assessed at the first head CT.

The use of these 5 points is the same as the points contained in the ICH score, butthere are different intervals. In the ICH score, age is divided into 2 intervals, whereas the ICH-GS score is divided into 3intervals. In addition, what makes it different from the ICH score is that the ICH- GS score, points related to clot volume are also associated with the location of bleeding because of the difference in location space (Sandoval et. al., 2007).

Results and Discussion

The results revealed that there were atotal of 110 spontaneous intracerebral hemorrhage patients who had complete data in medical e-records during 2017-2019; 65.5% (72 people) were male and 34.5% (38 people) were female.

Table 2. Distribution of Sex

No	Sex	Frequency	Percent
1	Male	72	65,5 %
2	Female	38	34,5%
Total		100	100%

The data showed that 5.5% (6 people) had an ICH-GS score of 5; 38.2% (42 people) had an ICG-GS score of 6; 21.8% (24 people) had an ICH-GS score of 7; 20 % (22 people) had an ICH-GS score of 8; 5.5% (6 people) had an ICH-GS score of 9; 4.5% (5 people) had an ICH-GS score of 10; 3.6% (4 people) had an ICH-GS score of 11;and 0.9% (1 patient) had an ICH-GS score of 12.

Table 3. ICH-GS Score

No	ICH-GS Score	Frequency	Percent
1	Score 5	6	5.5
2	Score 6	42	38.2
3	Score 7	24	21.8
4	Score 8	22	20.0
5	Score 9	6	5.5
6	Score 10	5	4.5
7	Score 11	4	3.6
8	Score 12	1	9
Total		110	100

The data on ICH-GS score and the outcomes of patients showed that among patients who had an ICH-GS score of 5, 5 people were found with survival outcome and 1 person was found with death outcome. Patients with ICH-GS score 6, 40 people were found with survival outcome and 2 people died. Among patients with an ICH-GS score of 7, 24 people were identified with survival outcome and nopatients died. Among patients with an ICH-GS score of 8, 16 people were identified with survival outcome and 6 patients died. Among patients with an ICH-GS score of 9, 3 people were identified with survival outcome and 3 patients died. Of patients with an ICH-GS score of 10, 2 people wereidentified with survival outcome and 3 people died. Among patients with an ICH- GS score of 11, 2 people were identified with survival outcome and 2 people died. Finally, a patient with an ICH-GS score of 12 died.

Table 4. ICH-GS Score and Outcomes

ICH-GS Score and Outcomes	Frequency	Percent (%)	Cumulative Percent (%)
Score 5 with survival outcome	5	4,5	4,5
Score 5 with death outcome	1	0,9	5,5
Score 6 with survival outcome	40	36,4	41,8
Score 6 with death outcome	2	1,8	43,6
Score 7 with survival outcome	24	21,8	65,5
Score 8 with survival outcome	16	14,5	80,0
Score 8 with death outcome	6	5,5	85,5
Score 9 with survival outcome	3	2,7	88,2
Score 9 with death outcome	3	2,7	90,9
Score 10 with survival outcome	2	1,8	92,7
Score 10 with death outcome	3	2,7	95,5
Score 11 with survival outcome	2	1,8	97,3
Score 11 with death outcome	2	1,8	99,1
Score 12 with survival outcome	1	0,9	100
Total	110	100	

Data concerning with age and outcome showed that among patients aged <45 years, 8 people were identified with survival outcome of, whereas among patients aged >45 years, 3 people with death outcome. Patients aged 45-64 years, 79 people were found with survival outcome and 11 people with death outcome. Amongpatients aged 65 years, 7 people were identified with survival outcome and 2 people died.

Table 5. Age and Outcomes

Age and Outcomes	Frequency	Percent (%)	Cumulative Percent (%)
<45 years old with survival outcome	8	7,3	7,3
<45 years old with death outcome	3	2,7	10,0
45-64 years old with survival outcome	79	71,8	81,8
45-64 years old with death outcome	11	10,0	91,8
>=65 years old with survival outcome	7	6,4	98,2
>=65 years old with death outcome	2	1,8	100
Total	110	100	

In the GCS data at the emergency department and the outcome, it was found that among patients with GCS ≥13, 67 people were identified with survival outcome and 3 people died. Patients with GCS 9-12, 14 people were found with survival outcome and 7 people died. Finally, among patients with GCS ≤8, 10 people were identified with survival outcome and 9 people died.

Table 6. GCS and Outcomes

GCS and Outcomes	Frequency	Percent (%)	Cumulative Percent (%)
GCS >=13 with survival outcome	67	60,9	60,9
GCS >=13 with death outcome	3	2,7	63,6
GCS 9-12 with survival outcome	14	12,7	76,4
GCS 9-12 with death outcome	7	6,4	82,7
GCS <=8 with survival outcome	10	9,1	91,8
GCS <=8 with death outcome	9	8,2	100
Total	110	100	

Data regarding the volume of spontaneous intracerebral hemorrhage and the outcome revealed there were 77 patients with survival outcome had a volume <40 mL bleeding in the supratentorial region, whereas 6 patients died. In supratentorial hemorrhage with a volume of 40-70 mL group, 8 people were identified with survival outcome and 1 person died. In supratentorial hemorrhage

with volume >70 mL group, 5 people survived and 6 people with death outcome.

In the data regarding infratentorial bleeding with a volume <10 mL, it was found that 1 person had survival outcome and 4 people with a death outcome. In the data regarding infratentorial bleeding volume >20 mL, 1 person had survival outcome and 1 person died.

Table 7. Volume and Outcomes

Volume and Outcomes	Frequency	Percent (%)	Cumulative Percent (%)
Supratentorial vol <40mL with survival outcome	77	70,0	70,0
Supratentorial vol <40mL with death outcome	6	5,5	75,5
Supratentorial vol 40-70 with survival outcome	8	7,3	82,7
Supratentorial vol 40-70 with death outcome	1	0,9	83,6
Supratentorial vol >70mL with survival outcome	5	4,5	88,2
Supratentorial vol >70mL with death outcome	6	5,5	93,6
Supratentorial vol <10mL with survival outcome	1	0,9	94,5
Supratentorial vol <10mL with death outcome	4	3,6	98,2
Supratentorial vol >20mL with survival outcome	1	0,9	99,1
Supratentorial vol >20mL with death outcome	1	0,9	100
Total	110	100	

In the data regarding the presence or absence of IVH and outcomes, there were 74 patients who did not experience IVH with survival outcome and 8 people with death outcome. A total of 18 people experienced IVH with survival outcome and 10 people with a death outcome.

Table 8. IVH and Outcomes

IVH and Outcomes	Frequency	Percent (%)	Cumulative Percent (%)
Absence of IVH with survival outcome	74	67,3	67,3
Absence of IVH with death outcome	8	7,3	74,5
Presence of IVH with survival outcome	18	16,4	90,9
Presence of IVH with death outcome	10	9,1	100
Total	110	100	

In the data concerning with the location of bleeding and outcomes, 89 patients with supratentorial hemorrhage were found with survival outcomes and 13 died, while in infratentorial bleeding, 3 patients were alive and 5 people died.

Table 9. Location and Outcomes

Location and Outcomes	Frequency	Percent (%)	Cumulative Percent (%)
Supratentorial with survival outcome	89	80,9	80,9
Supratentorial with death outcome	13	11,8	92,7
Infratentorial with survival outcome	3	2,7	95,5
Infratentorial with death outcome	5	4,5	100
Total	110	100	

Conclusion

The results of the ICH-GS score can be usedto facilitate communication both with fellow health workers and with the patient's family. Trend of the data showed that ICH-GS score is not consistent in showing the prognosis of spontaneous intracerebral hemorrhage (the smaller the ICH-GS score should have better prognosis than the higher score), while the information based only on volume and location can predict the prognosis more consistently.

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