

BRAIN RESUSCITATION IN SEVERE HEAD INJURY AT SANGLAH CENTRAL GENERAL HOSPITAL DENPASAR 2020

Made Anindya Dwikinta¹, Tjokorda Gde Bagus Mahadewa²,
Sri Maliawan², I Wayan Nirvana²

¹Bachelor of Medicine and Doctoral Profession Study Program, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia

²Departement of Surgery, Division of Neurosurgery, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia

e-mail: kintaanindya15@gmail.com

ABSTRACT

Head trauma is a serious problem worldwide and causes morbidity and mortality at a young age. The increase in the number of severe head injuries continues to occur along with the number of accidents. This study aimed to examine the characteristics of brain resuscitation in patients with a severe head injury. Descriptive research with cross-sectional research method and the data obtained as many as 35. Data processing using SPSS and displayed in a distribution table according to the variables. This study found that patients with severe head injuries were most often at the age of >45 years, namely 18 people (51.4%), and male sex was more common than women as many as 24 people (68.6%). The most common GCS was found with GCS 3-5 as many as 21 people (60%). The brain resuscitation regimen in patients with a severe head injury was given crystalloid solution (0.9% NaCl, Ringer's lactate) in 35 people (100%), mannitol 20% in 22 people (62.9%), and phenytoin in 33 people (94.3%). The GOS value of all patients with severe head injury with a GOS value of 1 or died (100%). Most deaths from severe head injury patients were in the first <48 hours as many as 27 people (77.1%)

Keywords : brain resuscitation, traumatic brain injury, severe head injury.

INTRODUCTION

Head injury is a serious health problem that causes death and disability at a young age. Patients with head injuries often experience cerebral edema caused by the accumulation of excess fluid in the intracellular and extracellular spaces of the brain or intracranial hemorrhage that causes an increase in intracranial pressure.

Data from the CDC in 2006-2014 showed the incidence of head injury in the United States was approximately 2.87 million visits to emergency departments, including 288,000 cases in hospitalization and deaths, reaching 56,800 cases. In Europe, severe head injuries admitted to hospitals are about 235 cases per 100,000 people annually. In Indonesia, according to *Riskesdas* in 2018, the prevalence of head injuries was 11.9%. At Haji Adam Malik General Hospital in Medan, 1,627 cases of head injury occurred in 2010. In Bali, the incidence of traumatic head injury, especially at Sanglah Hospital, is estimated to reach 2000 cases per year, of which 30% are moderate and severe head injuries.^{2,3,4}

Head injuries were categorized according to their severity with the Glasgow Coma Scale (GCS) and their morphology. The GCS score for the severity of head injury is mild head injury with a score of 14-15, moderate head

injury with a score of 9-13 and severe head injury with a score of 3-8. According to research at RSUD Dr. Abdul Aziz, Singkawang the more severe the degree of head injury will increase the incidence of patient mortality. GCS assessment is very important to master because it has usefulness to be able to provide treatment, determine improvement, worsening, and prognosis.^{5,6}

Based on the pathology, injury can be classified into two mechanisms or stages, namely primary injury (primary insult) and secondary injury (secondary insult) which causes secondary brain injury. Primary head injuries can result in damage to the scalp (lacerations), bone (cranial, cranial base, and facial bones), vascular, or cerebral contusions. Secondary head injury occurs sometime after the primary head injury (impact). The main causes of secondary head injury are hypotension, hypoxia, increased intracranial pressure, and decreased blood perfusion to the brain and pyrexia.⁷

Some data indicate that neurological damage does not only occur during trauma (primary injury), but occurs within minutes, hours, and days. Half the mortality rate in traumatic brain injury occurs in the first 2 hours after trauma. The steps needed to reduce high morbidity and mortality in head injuries are better understanding and management of the primary survey and resuscitation and

secondary surveys for prevention of secondary head injuries by taking prompt, appropriate and correct action. Primary survey and resuscitation are performed to stabilize vital functions, prevent hypotension, hypoxia, and cerebral ischemia.⁸

The primary survey has three stages including (A) Airway, namely controlling the airway so that hypoxia does not occur, (B) Breathing, which is adequate ventilation; and (C) Circulation, which is maintaining cerebral blood flow (cerebral perfusion pressure) and intracranial pressure (ICP). (D) Disability, namely rapid evaluation of neurological status and (E) Exposure, namely removing the patient's clothes to evaluate the patient's body. The primary survey was conducted to prevent secondary insults from occurring so that secondary head injuries would not occur. The secondary survey is an assessment of a thorough head to toe examination to identify all injuries that can worsen the patient's condition. The secondary survey includes a head-to-toe examination and a neurological examination, and if it is stable, you can carry out supporting examinations such as a CT scan.^{9,10} Based on the background and data obtained, the authors are interested in researching brain resuscitation characteristics in severe head injury patients at Sanglah Hospital, Denpasar.

METHODS

This study used a descriptive study design with a cross-sectional design to determine the characteristics of brain resuscitation in severe head injury patients at Sanglah Hospital Denpasar in 2020. Data collection was obtained from the medical records of patients with severe head injuries at Sanglah Hospital Denpasar. The inclusion criteria of this study used severe head injury patients who did not receive decompression craniectomy surgery.

The sample of this study used total sampling and consecutive sampling techniques on 35 patients who met the inclusion criteria. The data in this study were analyzed using a univariate SPSS application and will be presented in the form of a frequency distribution table with variables based on age, gender, Glasgow coma scale, Glasgow outcome scale, brain resuscitation regimen and hourly mortality.

RESULTS

This study examines the characteristics of brain resuscitation in severe head injuries at the Sanglah Central General Hospital (RSUP) Denpasar in 2020. This study records age, gender, GCS, GOS, brain resuscitation regimen.

Table 1. Characteristics of Severe Head Injury by Age

Age (year)	Frequency (n)	Percentage (%)
3-11	2	5.7
12-25	8	22.9
26-45	7	20.0
>45	18	51.4
Total	35	100.0

In Table 1, the results show that the most severe head injury patients who were treated with brain resuscitation at Sanglah Hospital Denpasar were the elderly range, which was 18 people (51.4%) while the least age distribution occurred in children, ranging from 0- 11 years, namely 2 people (5.7%).

Table 2. Characteristics of Severe Head Injury by Gender

Gender	Frequency (n)	Percentage (%)
Male	24	68.6
Female	11	31.4
Total	35	100.0

Based on the study results, it showed that the majority of patients who received brain resuscitation treatment for severe head injuries at Sanglah Hospital Denpasar were male. Namely, as many as 24 people (74.6%), while women were found to have fewer severe head injuries, namely 11 people. (31.4%) (Table 2).

Table 3. Characteristics of Severe Head Injury by Glasgow Coma Scale

GCS	Frequency (n)	Percentage (%)
3-5	21	60.0
6-8	14	40.0
Total	35	100.0

When viewed from the classification of patients according to the Glasgow Coma Scale, the results obtained were the majority of patients who came with severe head injuries at Sanglah Hospital, Denpasar, as many as 21 people were assessed to have a total initial GCS of 3-5. There were also 14 patients with severe head injury with a total GCS of 6-8 (Table 3).

Table 4. Characteristics of Severe Head Injury Based on the Glasgow Outcome Scale

GOS	Frequency (n)	Percentage (%)
Death (1)	35	100.0
Alive (2-5)	0	0
Total	35	100.0

From the results of this study, it was found that the GCS value of patients with brain resuscitation in severe head injuries at Sanglah Hospital Denpasar, namely died (1) as much as 100.0% (Table 4).

Table 5. Characteristics of Severe Head Injury Based on Brain Resuscitation Regimen

Brain Resuscitation Regimen	Frequency (n)	Percentage (%)
Crystalloid	35	100.0
Mannitol 20%	22	62.9
Phenytoin	33	94.3

Based on the findings in this study regarding the treatment of brain resuscitation given to patients with a severe head injury, the majority of patients received crystalloids in the form of normal saline (0.9% NaCl) or with Ringer's lactate as many as 35 patients (100.0%). In addition to all patients receiving crystalloids, 33 patients were given anticonvulsants, namely phenytoin. Of the 35 patients, 22 were given mannitol to severe head injury patients who received brain resuscitation at Sanglah Hospital Denpasar (Table 5).

Table 6. Characteristics of Severe Head Injury Based on Mortality (hours)

Mortality (hour)	Frequency (n)	Percentage (%)
< 48 hours	27	77.1
> 48 hours	8	22.9
Total	35	100.0

Based on data from this study, brain resuscitation in patients with severe head injuries at Sanglah Hospital Denpasar mostly came and received treatment for <48 before the patient died. Meanwhile, patients who survived more than 48 hours were quite a few, namely 8 people (22.9%) (Table 6).

DISCUSSION

Based on the study results in table 1, it was found that brain resuscitation in severe head injuries was most commonly found at the age above 45 years, which were classified as elderly, as many as 18 people. This research is not in line with the research conducted at RSUD dr. M. Haulussy Ambon, where the most patients with severe head injuries were found in adolescents aged 15-24 years, namely 12 people (40%). The elderly often experiences head injuries due to lack of awareness or introspection, decreased balance, and accidents or falls from a height. The elderly experience anatomical and physiological changes due to the ageing process so that it has an impact on increasing morbidity and mortality up to 28% in elderly patients.^{11,12}

Based on table 2, this study is in line with research conducted by Tugurejo Hospital Semarang, where the majority were in the male group as many as 47 people (75.4%) and women as many as 15 people (24.6%). Men

experience head injuries more often due to work and physical activities that are riskier than women.¹³

Based on table 3, compared to research from the Emergency Installation of Tugurejo General Hospital Semarang in 2010-2011, the results were relatively similar. The majority of the initial GCS 3-5 were 19 people. Please note that a GCS below 8 is a diffuse injury. In the classification of CT scan, Marshall diffuse injury is divided into 4 grades. Diffuse injury grade I do not show bleeding and intracranial pathological abnormalities with a 30-40% mortality rate. In diffuse injury grade II, the cistern still looks good with a midline shift of 0-5mm, there are focal lesions, and there is no intracranial hemorrhage >25 ml, and the mortality rate is 60%. Diffuse injury grade III (swelling) narrowed or obliterated cistern with a midline shift of 0-5mm and there was no intracranial hemorrhage >25 ml with a mortality rate of 80-85%. In diffuse injury grade IV with a midline shift > 5 mm, it is divided into 2 categories: evacuated mass lesions and non-evacuated mass lesions with intracranial bleeding with a volume of more than 25 mm no surgery with a mortality rate of 99%. RSUD dr. Abdul Aziz Singkawang that there is a positive correlation between the Marshall CT Score and the mortality of head injury patients where the higher the Marshall score, the higher the mortality rate, but there will be a decrease in the category of diffuse injury grade IV performed with evacuated mass lesions due to surgery on the patient.^{14,15}

Based on the Glasgow Outcome Scale figures, this study is almost the same as the research at Prof. RSUP. Dr. R.D. Kandou, Manado, in 2010-2011, as many as 18 people died while 7 people are still alive. This happened is because the samples used were brain resuscitation patients with severe head injuries who were not operated on. This sample was also found with diffuse injury grade III and IV non-evacuated mass lesions that had a poor prognosis with mortality reaching 100% and no brain repair. Treated or not treated still has a poor prognosis. In addition, there is a risk factor for the age where the increasing age, the greater the risk of poor outcome in patients with a severe head injury.^{3,16}

In table 5, the brain resuscitation regimen at Sanglah Hospital Denpasar uses crystalloid fluids, mannitol and anticonvulsants as brain resuscitation regimens. Crystalloid fluid is the initial fluid used in trauma patients with the advantage that it is cheap, readily available, does not cause allergies, and is effective for restoring body fluids so that crystalloid fluid becomes the primary regimen for brain resuscitation. This review is comparable to this study because crystalloid solutions were administered to all patients with a severe head injury as initial management.¹⁷

Crystalloid fluids given in the brain resuscitation regimen were 0.9% NaCl and Ringer's lactate. Normal saline is used to replace lost body fluids, correct fluid and electrolyte imbalances and keep the body properly hydrated. Ringer's lactate is a type of crystalloid liquid containing calcium, potassium, lactate, sodium, chloride and water, which is suitable for severe head injury patients who experience bleeding because lactic acidosis can occur, so Ringer's lactate is suitable for correcting this.¹⁷

Mannitol 20% is an osmotic diuretic that will make a difference in osmolarity. It can draw water from brain tissue into cerebral blood vessels to reduce total brain volume and reduce intracranial pressure in patients with cerebral edema and intracranial hypertension. There is a contraindication to administering mannitol, namely in patients with hypotension, because the usage of mannitol does not reduce ICP in hypovolemic patients and can exacerbate hypotension and cerebral ischemia. Only patients who are not hypotensive are given 20% mannitol. This is consistent with this study that not all patients with severe head injury were given 20% mannitol as their brain resuscitation regimen.¹⁸

Phenytoin is a first-generation antiepileptic drug and has been FDA-approved as a prophylactic drug for seizures during and after neurosurgery. Phenytoin is given in the first 24 hours after head injury with a loading dose of 10-20 mg/kgBW. This review is comparable to this study. Only 2 people were not given phenytoin probably because there were no focal lesions but had cerebral edema, diffuse injury, swollen brain stem leading to brain ischemia and eventually death. Brain resuscitation performed on patients with diffuse injury has no effect because there is widespread damage that occurs in extracranial respiratory failure, hypoxia, and intracranial cerebral edema, which affects the increase in ICP, decreased perfusion and brain ischemia so that it can cause brain death.¹⁹

Based on table 6 this study is not in line with research from Sam Ratulangi University Manado. As many as 14 patients (56%) died at >48 hours, while in the <48 hours group, as many as 4 people. The thing that makes this study different is the inclusion criteria of the sample in the study, where the study in Manado also used patients who could still be treated with evacuated mass lesions so that the mortality of patients who survived more than 48 hours was higher. Based on research from Mbemba, there is a relationship between early death and an increased Marshall CT Score. In non-evacuated mass lesions, the patient's mortality reaches 100% due to the presence of complete edema, and the pressure will be transmitted in all directions, causing intracranial hypertension, no intra-arterial perfusion and causing the brain to become ischemic. If the brain is ischemic and persists for a long time, it will cause brain death. In mortality less than 48 hours after the event of injury because cerebral blood flow will be reduced to more than half of normal brain blood flow so that the brain can experience ischemia which will eventually lead to hypotension.^{9,15,16}

CONCLUSION AND SUGGESTION

Patients with brain resuscitation in severe head injury were mostly found in the age range above 45 years and were male.

The most frequent initial total GCS was found with a score of 3-5 and with GOS 1. Brain resuscitation in severe head injury was given crystalloids in the form of 0.9% NaCl and Ringer's lactate, and 20% mannitol was given, and anticonvulsants were given in the form of phenytoin. The hourly mortality rate is the most common, less than 48 hours.

There is a limitation in this study, which was only conducted on patients with a severe head injury who did not undergo a decompression craniectomy (surgery). Further research could be carried out on this matter. Related parties are expected to be able to educate the public about maintaining and paying attention to personal safety at work and activities. This research is presented in the form of a thesis summary to fulfill publication obligations.

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This research is complete from the thesis which is presented in the form of a summary which is used to fulfill the obligation to publish research journals.

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