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Use of 20% Mannitol in Patients with Hemorrhagic Stroke

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Abstract

This case report describes the clinical course, management, and outcome of a 70-year-old male patient diagnosed with hemorrhagic stroke with intracerebral hemorrhage in the right basal ganglia, accompanied by intraventricular hemorrhage and cerebral edema. The patient presented with left-sided weakness, slurred speech, facial asymmetry, and decreased level of consciousness. Comprehensive management included intravenous fluids, osmotic diuretics (mannitol), antifibrinolytics (tranexamic acid), vitamin K, neuroprotective agents (citicoline), antibiotics, and supportive therapies. Despite decompressive craniectomy and intensive care, the patient's neurological status progressively deteriorated from compos mentis to coma. Monitoring showed unstable vital signs, impaired coagulation parameters, and fluctuating blood glucose levels. No significant drug-related problems or adverse reactions were identified during treatment. However, the severity of brain injury, increased intracranial pressure, and associated complications led to poor clinical outcomes. The patient was declared deceased on January 25, 2026. This case highlights the importance of early intervention, continuous monitoring, and comprehensive management in hemorrhagic stroke patients.

Keywords: ***Hemorrhagic Stroke, Intracerebral Hemorrhage, Intracranial Pressure, Pharmacotherapy, Case Report.***

INTRODUCTION

Stroke is a neurological disorder that frequently occurs and requires immediate and appropriate management. It is defined as a sudden disruption of brain function due to impaired cerebral blood circulation and may occur at any time in any individual. The underlying causes of stroke include cerebral thrombosis, embolism, hemorrhage, and hypoxia affecting brain tissue (Sacco et al., 2013). From a clinical perspective, stroke is characterized by rapidly developing neurological deficits of vascular origin that persist for more than 24 hours or result in death (Kemenkes, 2019).

Globally, stroke remains one of the leading causes of mortality and long-term disability. The burden of stroke continues to rise due to population aging and the increasing prevalence of risk factors such as hypertension and diabetes (Dipiro, 2023). Accurate diagnosis is essential and is generally established through clinical evaluation supported by neuroimaging techniques, such as computed tomography (CT scan) or magnetic resonance imaging (MRI), to distinguish between ischemic and hemorrhagic stroke (Goldszmidt & Caplan, 2013). In Indonesia, stroke incidence is significantly higher among the elderly population, with the majority of cases occurring in individuals aged over 75 years, while younger populations show considerably lower prevalence (Irawan et al., 2024).

National data indicate that stroke is a major contributor to mortality in Indonesia, with tens of thousands of deaths recorded annually. Epidemiological findings from the Basic Health Research (Riskesdas) demonstrate a substantial increase in stroke prevalence over time, reflecting the growing public health burden (Kemenkes, 2019). Furthermore, regional variations in stroke incidence suggest disparities in healthcare access, lifestyle factors, and population health profiles across different provinces. These findings emphasize the importance of early detection, prevention strategies, and effective management to reduce stroke-related morbidity and mortality.

Stroke is broadly classified into two main categories: ischemic stroke and hemorrhagic stroke. Ischemic stroke, which accounts for the majority of cases, occurs due to obstruction of blood flow to the brain, commonly caused by thrombus formation or embolism in cerebral arteries (Valante et al., 2015). In contrast, hemorrhagic stroke results from the rupture of blood vessels, leading to bleeding within the brain parenchyma or surrounding spaces, which can rapidly increase intracranial pressure

and worsen patient outcomes (Aninditha & Wiratman, 2017). Despite being less common, hemorrhagic stroke is associated with higher mortality rates and more severe clinical manifestations (Dipiro, 2023).

The occurrence of stroke is influenced by multiple risk factors, which are categorized into modifiable and non-modifiable factors. Hypertension is recognized as the most significant modifiable risk factor, contributing substantially to both ischemic and hemorrhagic stroke (Sorganvi et al., 2014). Other contributing factors include diabetes mellitus, dyslipidemia, obesity, smoking, excessive alcohol consumption, and sedentary lifestyle (Irawan et al., 2024). In addition, cardiovascular conditions such as atrial fibrillation play a critical role in the development of embolic stroke by facilitating clot formation in the heart that may travel to cerebral circulation (American Stroke Association, 2016). Non-modifiable factors such as age, sex, and genetic predisposition also influence stroke risk (Amin & Juniati, 2017).

Antiplatelet therapy, anticoagulation, and risk factor control are also essential components of long-term management (Dipiro, 2020). In hemorrhagic stroke, treatment focuses on stabilizing the patient, controlling bleeding, reducing intracranial pressure, and managing complications (Aninditha & Wiratman, 2017). Another pharmacological agent that has gained attention is tranexamic acid, an antifibrinolytic drug that inhibits plasminogen activation and stabilizes fibrin clots, thereby reducing bleeding (Khan et al., 2017). Its effectiveness has been demonstrated in various clinical settings, including surgical procedures and trauma-related bleeding (Pabinger et al., 2017).

Given the increasing prevalence and significant impact of stroke on public health, a comprehensive understanding of its mechanisms, risk factors, and treatment strategies is essential. Therefore, this study aims to further explore stroke management, particularly focusing on pharmacological interventions such as mannitol and tranexamic acid, in order to improve patient outcomes and reduce the burden of stroke.

RESEARCH METHODS

Study Design

This study was designed as a single-patient case report to describe the clinical characteristics, management, and outcomes of a patient diagnosed with intracerebral hemorrhage.

Data Source and Collection

Clinical data were obtained retrospectively from the patient's medical records, including demographic information, history of present illness, past medical history, medication history, physical examination findings, vital signs, laboratory results, and supporting examinations during hospitalization.

Eligibility Criteria

The subject included in this case study was an adult patient diagnosed with intracerebral hemorrhage, confirmed clinically and supported by relevant diagnostic evaluations, who received inpatient care.

Data Extraction and Management

Data extraction was conducted systematically using a structured format. Extracted variables included patient identity, chief complaints, history of present illness, past medical and medication history, allergy history, family history, vital signs monitoring, laboratory findings (hematology, clinical chemistry, blood gas analysis, and urinalysis), as well as additional diagnostic examinations.

Quality and Risk-of-Bias Assessment

To ensure data reliability, all clinical information was cross-checked with medical records and documented findings. However, as a single-case report, this study is inherently subject to limitations, including lack of generalizability and potential information bias.

Data Synthesis

All collected data were analyzed descriptively to provide a comprehensive overview of the patient's clinical condition. The synthesis focused on trends in vital signs, laboratory parameters, and

clinical progression throughout hospitalization, highlighting key abnormalities and their potential clinical implications.

RESULTS AND DISCUSSION

Inpatient Treatment

During hospitalization from January 17 to January 22, 2026, the patient received comprehensive intravenous therapy aimed at stabilizing hemodynamic status, preventing complications, and managing symptoms. Fluid therapy with 0.9% sodium chloride was administered continuously. Empirical antibiotic therapy using ceftriaxone was initiated, along with supportive medications including paracetamol for analgesic and antipyretic purposes, omeprazole and ranitidine for gastrointestinal protection, and ondansetron to control nausea and vomiting. Hemostatic management included tranexamic acid and vitamin K to reduce the risk of ongoing bleeding. Neuroprotective therapy with citicoline and osmotic therapy with mannitol 20% were also administered consistently to manage cerebral edema and support neurological recovery.

From January 23 to January 25, 2026, the patient's treatment regimen was continued and adjusted according to clinical progression. Ceftriaxone, paracetamol, omeprazole, ondansetron, tranexamic acid, and vitamin K were maintained with similar dosing frequencies. Mannitol therapy was continued to control intracranial pressure, while citicoline was no longer administered during this period. Additionally, a continuous intravenous infusion of vascon pump therapy was initiated and maintained over 24 hours to support hemodynamic stability. Overall, the treatment approach remained focused on stabilizing the patient's condition, preventing secondary complications, and optimizing neurological outcomes.

Patient Follow-Up

During the initial phase of hospitalization (January 17–19, 2026), the patient consistently presented with left-sided weakness, slurred speech, facial asymmetry, and impaired swallowing, accompanied by occasional agitation. Vital signs were relatively stable, with blood pressure ranging from 130/70 to 150/100 mmHg and oxygen saturation maintained at 97%. The level of consciousness remained compos mentis with a Glasgow Coma Scale (GCS) score of E4M6V5. Clinical assessment indicated risks of ineffective cerebral perfusion, impaired physical mobility, verbal communication impairment, and swallowing difficulties. The patient received supportive therapy including intravenous fluids, oxygen supplementation, neuroprotective agents, and hemostatic treatment. No drug-related problems were identified, and continuous education and monitoring of drug therapy and potential adverse effects were conducted.

From January 20 to January 22, 2026, the patient's condition progressed with a diagnosis of ischemic stroke with hemorrhagic transformation, requiring decompressive craniectomy due to cerebral edema. Postoperatively, the patient's consciousness declined to soporocoma, although vital signs remained relatively stable. The same therapeutic regimen was continued with the addition of antibiotics, proton pump inhibitors, antiemetics, and vitamin K. Between January 23 and January 24, the patient remained in a critical condition with decreased level of consciousness (GCS E2M6VX), intubation, and persistent left-sided weakness. Oxygen saturation dropped to 91%, indicating respiratory compromise. On January 25, 2026, the patient's condition further deteriorated, characterized by decreased GCS (E1M2VX), tachycardia, and tachypnea, along with hyperglycemia suspected to be secondary to type 2 diabetes mellitus or reactive causes. Despite continued management, the patient was declared deceased at 13:00 WIB. Throughout the hospitalization period, no significant drug-related problems were documented, and pharmaceutical care focused on therapy monitoring and patient or family education.

Drug Review

The patient received multiple medications during hospitalization aimed at managing intracranial pressure, preventing complications, and providing supportive care. Mannitol 20% was

administered intravenously as an osmotic diuretic to reduce cerebral edema by increasing plasma osmolality, thereby drawing fluid from brain tissue into the intravascular compartment and promoting diuresis. Intravenous 0.9% sodium chloride was used as fluid replacement to maintain electrolyte balance and intravascular volume. Ranitidine injection was given to reduce gastric acid secretion through H_2 receptor blockade, while omeprazole served a similar purpose as a proton pump inhibitor. Citicoline was administered as a neuroprotective agent to support neuronal membrane repair and reduce ischemic brain injury. Tranexamic acid was used as an antifibrinolytic agent to inhibit plasmin activity and stabilize blood clots, thereby preventing further bleeding. Ceftriaxone, a third-generation cephalosporin antibiotic, was prescribed to prevent or treat potential infections by inhibiting bacterial cell wall synthesis.

In addition, paracetamol was administered intravenously for its analgesic and antipyretic effects through inhibition of prostaglandin synthesis. Ondansetron was used to manage nausea and vomiting by acting as a selective 5-HT3 receptor antagonist, blocking serotonin-mediated emetic pathways. Vitamin K (phytomenadione) was also given to support coagulation by facilitating the activation of clotting factors II, VII, IX, and X in the liver. Overall, the pharmacological regimen was appropriate for the patient's clinical condition, particularly in addressing intracerebral hemorrhage, preventing secondary complications, and maintaining hemodynamic and metabolic stability, although careful monitoring was required due to potential side effects such as electrolyte imbalance, renal impairment, gastrointestinal disturbances, and hypersensitivity reactions.

Drug Therapy Worksheet (DTAW)

A drug-related problems (DRPs) evaluation was conducted for a patient diagnosed with hemorrhagic stroke under the care of dr. Rhudy Marseno, Sp. BS in Limpapeh Lantai 2. The assessment included several aspects such as indication appropriateness, drug selection, dosing regimen, potential duplication, allergy history, adverse drug reactions, drug interactions, medication use behavior, adherence, economic factors, and patient knowledge. Overall, no significant drug-related problems were identified. All medications prescribed were in accordance with the patient's clinical condition, with appropriate indications and no evidence of unnecessary therapy or untreated medical needs. The selected drugs were suitable in terms of efficacy and safety, while the dosing regimens, routes of administration, and duration of therapy were appropriate and aligned with standard treatment guidelines. In addition, no therapeutic duplication, clinically significant drug interactions, or adverse drug reactions were observed during the treatment period.

In terms of medication use behavior, a potential risk was identified related to antibiotic adherence, where premature discontinuation could lead to antimicrobial resistance; however, no actual non-compliance occurred in this case. The patient demonstrated good understanding of the prescribed therapy, indicating adequate medication knowledge. No allergy issues or economic barriers affecting treatment were identified, and overall adherence to therapy was satisfactory. Continuous monitoring and patient education were recommended to maintain optimal therapeutic outcomes and to prevent the emergence of future drug-related problems.

Pharmaceutical Care Plan

A pharmaceutical care plan was developed for a patient diagnosed with hemorrhagic stroke and stress ulcer. The primary therapeutic goal for hemorrhagic stroke management was to stop active bleeding and support hemostasis. This was achieved through the administration of antifibrinolytic therapy with tranexamic acid (1 ampoule, three times daily) and vitamin K (1 ampoule, three times daily) to support blood clot formation. Monitoring parameters included International Normalized Ratio (INR) and Prothrombin Time (PT), with target values of INR 0.8–1.2 and PT 13.0–16.0 seconds. In addition, intracranial pressure management was supported using mannitol (continuous infusion), with close monitoring of vital signs and neurological status. The expected outcomes were prevention of recurrent stroke, stabilization of neurological condition, and improvement in neurological function such as clear speech and symmetrical facial movement. Monitoring was conducted daily.

For stress ulcer prevention, the therapeutic goal was to prevent gastrointestinal complications related to critical illness and medication use. This was managed using ranitidine (50 mg twice daily)

and omeprazole (one vial twice daily). Clinical parameters monitored included symptoms such as nausea, vomiting, and epigastric pain. The expected outcome was the absence of gastrointestinal bleeding and resolution of gastric irritation symptoms. Monitoring was performed daily to ensure early detection of complications and evaluate treatment effectiveness.

Drug Therapy Monitoring

Drug therapy monitoring was performed to evaluate the effectiveness and safety of pharmacological treatment in a patient with hemorrhagic stroke. For hemostasis management, tranexamic acid 500 mg and vitamin K 10 mg were administered with monitoring of INR and PT values. The expected therapeutic range for PT was 13.0–16.0 seconds. Monitoring results showed elevated INR (1.35) and prolonged PT (19.7 seconds) on January 20 and January 23, indicating ongoing coagulation disturbance that required continued observation.

To reduce intracranial pressure, mannitol 20% was administered, with monitoring based on neurological status including level of consciousness, vomiting, and pupillary response. The patient was initially in a compos mentis state from January 17–20, but neurological status declined to soporocoma on January 21–23, indicating deterioration of brain function despite therapy. For fluid and electrolyte balance, 0.9% NaCl was given, with electrolyte monitoring showing sodium and potassium within or near normal limits during assessment.

Supportive therapies included citicoline 250 mg to improve neurological function, where motor weakness was monitored, although no detailed daily improvement data were recorded. Paracetamol 500 mg effectively maintained body temperature within normal range (36.3–36.8°C throughout monitoring), indicating good antipyretic response. For infection control, ceftriaxone 250 mg was used, with WBC decreasing from 11.70 µL (17/01) to 6.94 µL (20/01), indicating improvement in inflammatory status. Gastroprotective therapy with omeprazole and ranitidine showed stable gastric conditions without reported stress ulcer complications. Meanwhile, ondansetron was effective in controlling nausea and vomiting, with no recurrent symptoms reported during most of the monitoring period. Overall, therapy demonstrated partial clinical response, although neurological deterioration remained the primary concern requiring intensive management.

Monitoring of Therapeutic Effects

The patient was diagnosed with hemorrhagic stroke, with the primary therapeutic goal of reducing intracranial pressure. Mannitol was administered, and monitoring focused on vital signs, osmolarity, level of consciousness, and motor function. Over the observation period from January 17 to January 23, blood pressure fluctuated, with readings ranging from 150/100 mmHg to 109/57 mmHg, while pulse rates gradually decreased from 78 to 57 beats per minute. Body temperature remained relatively stable between 36.3°C and 36.8°C. Additional therapy aimed to control or stop active intracranial bleeding through the administration of tranexamic acid and vitamin K, although coagulation parameters (PT and APTT) were only assessed once, showing PT 19.7 and APTT 30.3. Preventive management for stress ulcers using ranitidine injection and omeprazole injection was also implemented, with no reported epigastric pain or signs of gastrointestinal bleeding throughout the monitoring period.

During the postoperative phase, management focused on reducing pain and fever, preventing infection, and minimizing nausea and vomiting. Paracetamol infusion was used for pain control, with a reported pain scale of 3 toward the end of observation and stable body temperature. Ceftriaxone IV was administered to prevent infection, and no signs of surgical wound infection or significant leukocytosis were observed. Ondansetron IV was given to prevent nausea and vomiting, with no such symptoms reported. The patient also had type 2 diabetes mellitus, managed with metformin, aiming to control blood glucose levels within fasting targets of 70–99 mg/dL and HbA1c below 5.7%. However, blood glucose monitoring showed fluctuations, including random levels of 135 mg/dL, 141 mg/dL, and a peak of 264 mg/dL, indicating that glycemic control was not yet optimal and requires further evaluation.

Monitoring of Adverse Drug Reactions

Monitoring of adverse drug reactions (ADRs) was carried out to ensure patient safety during the course of therapy. Each medication administered was closely observed for potential side effects based on its known safety profile. Ceftriaxone IV was monitored for allergic reactions, gastrointestinal disturbances, and skin rash. Paracetamol IV and omeprazole IV were observed for nausea, skin reactions, allergies, and possible liver enzyme elevation or digestive disorders. Tranexamic acid IV and vitamin K IV were also monitored for adverse effects such as nausea, vomiting, dizziness, headache, allergic reactions, and in some cases respiratory symptoms. Additionally, citicoline IV was associated with possible headache, dizziness, dry mouth, and allergic reactions.

Other medications such as mannitol IV and ranitidine IV were also included in the monitoring process. Mannitol IV was observed for nausea, diarrhea, skin reactions, and potential metabolic disturbances, while ranitidine IV was monitored for headache, itching, diarrhea, and allergic reactions. Overall, no significant adverse drug reactions were reported during the monitoring period. Continuous evaluation remained essential to detect any early signs of side effects and to ensure prompt management if any adverse reactions occurred.

NaCl 0.9% 500 mL

0.9% NaCl is an isotonic intravenous fluid used to maintain fluid and electrolyte balance in the body. In stroke patients, this fluid plays an important role in maintaining blood volume, stabilizing blood pressure, and ensuring optimal cerebral blood flow. Patients often experience limited fluid intake due to decreased consciousness or swallowing difficulties, making intravenous fluid administration essential. The usual dose of 0.9% NaCl is 500 mL/day given intravenously, or adjusted according to the patient's fluid needs and clinical condition. The expected effect is the prevention of dehydration and maintenance of hemodynamic stability. However, fluid administration must be monitored, as fluid overload may cause edema, including worsening cerebral edema. 0.9% NaCl should be stored at room temperature, protected from sunlight and light exposure.

Ceftriaxone Injection

Ceftriaxone is a third-generation cephalosporin antibiotic used to treat bacterial infections. In stroke patients, it is administered to prevent or treat secondary infections such as aspiration pneumonia or urinary tract infections. According to the patient's therapy, ceftriaxone is given at a dose of 2 × 1 gram per day intravenously. The expected therapeutic effect is the resolution of infection, preventing further deterioration of the patient's condition. Possible side effects include allergic reactions, diarrhea, and increased liver enzymes. Ceftriaxone injection should be stored at room temperature before reconstitution, and the reconstituted solution must be used according to storage guidelines.

Paracetamol Injection

Paracetamol is used to reduce fever and relieve mild to moderate pain. In stroke patients, fever must be controlled promptly because it can increase cerebral oxygen demand and worsen brain tissue damage. In this patient, paracetamol is administered as an injection at a dose of 3 × 1 gram per day intravenously. The expected therapeutic effects are reduction of body temperature and pain relief. However, high doses or long-term use may cause liver dysfunction. Paracetamol injection should be stored at room temperature and protected from sunlight.

Omeprazole Injection

Omeprazole is a proton pump inhibitor that reduces gastric acid production. In stroke patients receiving intensive care, it is used to prevent stress-related gastric ulcers and gastrointestinal bleeding. According to the treatment regimen, omeprazole is given at a dose of 2 × 1 ampoule per day intravenously. The expected effect is protection of the gastric mucosa. Possible side effects include nausea, abdominal pain, and headache. Omeprazole injection should be stored at room temperature and used within its stability period after dilution.

Ondansetron Injection

Ondansetron is an antiemetic used to manage nausea and vomiting. In stroke patients, vomiting can increase intracranial pressure and the risk of aspiration. Based on the therapy provided, ondansetron is administered at a dose of 2 × 1 to 3 × 1 ampoules per day intravenously, depending on

the patient's clinical condition. The expected effect is a reduction in nausea and vomiting, improving patient comfort. Possible side effects include headache and constipation. Ondansetron injection should be stored at room temperature and protected from light.

Tranexamic Acid Injection

Tranexamic acid is an antifibrinolytic agent used to prevent and control bleeding. In stroke patients, particularly those with hemorrhagic stroke, it helps stop ongoing bleeding. In this patient, tranexamic acid is administered at a dose of 2 × 1 to 3 × 1 ampoules per day intravenously. The expected effect is stabilization of blood clots and reduction of bleeding. Possible side effects include nausea, vomiting, and an increased risk of thrombosis if used inappropriately. This medication should be stored at room temperature and protected from light.

Vitamin K Injection

Vitamin K plays an essential role in the blood clotting process. In stroke patients, it is used to help correct coagulation disorders, especially in those at risk of bleeding. Based on the patient's therapy, vitamin K is administered at a dose of 3 × 1 ampoule per day intravenously. The main expected effect is improvement in the blood clotting process. Side effects are rare but may include allergic reactions. Vitamin K injection should be stored at room temperature and protected from light.

Citicoline Injection

Citicoline is a neuroprotective agent used to support brain function recovery in stroke patients. It works by repairing neuronal cell membranes and enhancing brain metabolism. In this patient, citicoline is administered at a dose of 2 × 1 ampoule per day intravenously. The expected effect is improvement in consciousness and neurological function. Side effects are usually mild, such as headache or sleep disturbances. Citicoline injection should be stored at room temperature and protected from light.

Mannitol Injection

Mannitol is an osmotic diuretic used to reduce intracranial pressure caused by cerebral edema. In stroke patients with increased intracranial pressure, it helps decrease brain swelling. According to the patient's therapy, mannitol is administered at a dose of 2 × 1 ampoule per day intravenously. The main expected effect is a reduction in intracranial pressure; however, careful monitoring is required as it may cause electrolyte imbalance and renal function disturbances. Mannitol should be stored at room temperature and checked for crystallization before use.

Ranitidine Injection

Ranitidine is an H2 receptor antagonist used to reduce gastric acid production. In stroke patients, it is used to prevent stress ulcers and gastrointestinal bleeding. Based on the treatment regimen, ranitidine is administered at a dose of 2 × 1 ampoule per day intravenously. The expected effect is protection of the gastrointestinal tract, while possible side effects include headache and mild digestive disturbances. Ranitidine injection should be stored at room temperature and protected from light.

Dosage Calculation

Based on the patient's characteristics (age: 70 years; body weight: 70 kg) and diagnosis of hemorrhagic stroke, the administered drug doses were evaluated and found to be consistent with standard treatment guidelines (PNPK Stroke 2019). Tranexamic acid was given at a dose of 3 × 1 ampoule per day (500 mg per ampoule), totaling 1,500 mg/day, which is within the recommended range of 6–12 g/day administered within ≤72 hours. Vitamin K was administered at 3 × 1 ampoule per day (10 mg per ampoule), totaling 30 mg/day, which is still appropriate considering dose adjustments in active bleeding, despite the standard dose being 10 mg IV. Mannitol 20% was given at 4 × 125 mL per day, with each 125 mL containing 25 g, resulting in a total daily dose of 100 g; this falls within the standard dosing range of 0.25–1 g/kg body weight per dose (17.5–70 g/dose for this patient). Ranitidine was administered at 2 × 50 mg per day (100 mg/day), consistent with the standard dose of 50 mg IV every 8–12 hours. Omeprazole was given at 2 × 1 vial per day (40 mg per vial), totaling 80 mg/day, which is within the recommended range of 40–80 mg/day intravenously. Overall,

all administered drug dosages were considered appropriate and in accordance with established clinical guidelines.

Plan

The general management of hemorrhagic stroke aims to stabilize the patient's condition, prevent further bleeding, and reduce the risk of increased intracranial pressure. The patient is advised to undergo bed rest with the head elevated approximately 30° to improve cerebral venous return and lower intracranial pressure. Airway, breathing, and circulation must be well maintained to ensure adequate oxygen supply to brain tissue. Fluid intake is administered carefully through intravenous therapy to prevent dehydration without increasing intracranial pressure, while nutritional support is adjusted based on the patient's swallowing ability to prevent aspiration; if consciousness is decreased, enteral feeding via a feeding tube may be indicated. Pharmacological therapy is directed at controlling bleeding, reducing intracranial pressure, preventing complications, and supporting brain recovery. This includes intravenous fluids (0.9% NaCl) to maintain fluid balance and cerebral perfusion, mannitol to reduce cerebral edema and prevent herniation, hemostatic agents such as tranexamic acid and vitamin K to control bleeding and improve coagulation, and neuroprotective agents like citicoline to support neuronal recovery.

Additional medications include antipyretics and analgesics such as paracetamol to control fever and pain, gastric protection agents such as omeprazole or ranitidine to prevent stress-related gastrointestinal bleeding, antiemetics like ondansetron to prevent nausea and vomiting that may increase intracranial pressure, and antibiotics when there is a risk or presence of infection. Continuous monitoring is essential to assess the patient's clinical progression and detect complications early, including regular observation of vital signs (especially blood pressure), level of consciousness, motor and sensory function, signs of increased intracranial pressure, and fluid-electrolyte balance, as well as evaluation of therapeutic response. Education is also provided to the patient and family regarding the nature of hemorrhagic stroke, its causes, potential complications, the importance of adherence to treatment, recognition of warning signs such as decreased consciousness or severe headache, control of risk factors like hypertension, and the importance of rehabilitation and a healthy lifestyle to prevent recurrence.

Discussion

A 70-year-5-month-old male patient was admitted to Dr. Drs. M. Hatta Brain Hospital, Bukittinggi, on January 17, 2026, with a diagnosis of hemorrhagic stroke. Prior to admission, the patient had experienced left-sided weakness for approximately 18 hours, slurred speech, facial drooping, and deviation of the lips. Upon arrival at the emergency department, the patient complained of nausea and brown-colored vomiting, along with impaired swallowing reflex (dysphagia). The patient had undergone thrombolytic therapy at Awalbross Hospital at 02:00 AM; however, the family requested discharge afterward. A nasogastric tube (NGT) showed greenish output. The patient had a past medical history of benign prostatic hyperplasia (BPH), no known drug or food allergies, and a family history of hypertension. Physical examination revealed a compos mentis level of consciousness, pulse rate of 88 beats per minute, respiratory rate of 20 breaths per minute, body weight of 70 kg, and a Glasgow Coma Scale (GCS) score of E4 M6 V5.

In the emergency department, the patient was administered intravenous fluid therapy with 0.9% NaCl at 500 mL (12-hour infusion, 14 drops per minute) to meet fluid and electrolyte needs, correct dehydration, and maintain metabolic stability. Intravenous ranitidine was given for gastric protection, while citicoline was administered to provide neuroprotection. Tranexamic acid was given intravenously as an antifibrinolytic agent to prevent and control intracranial bleeding. Mannitol, an osmotic diuretic, was administered to reduce intracranial pressure due to cerebral edema, with a tapered dosing regimen: 4 × 125 cc on the first day, 3 × 125 cc on the second day, 2 × 125 cc on the third day, and 1 × 125 cc on the fourth day. Laboratory results from January 17–18, 2026, including clinical chemistry and hematology, indicated elevated cholesterol and blood glucose levels.

During hospitalization, the patient did not show improvement in consciousness and remained unconscious in the ICU. The patient received ceftriaxone injection 2 × 2 g as an antibiotic to prevent

postoperative bacterial infection, paracetamol injection 3 × 1 g as an analgesic for pain management, omeprazole injection 2 × 1 vial to reduce gastric acid secretion, ondansetron injection 3 × 1 ampule as an antiemetic to prevent nausea and vomiting, tranexamic acid 3 × 1 ampule to control bleeding, and vitamin K injection 3 × 1 ampule to support blood clotting and manage bleeding. Postoperative evaluation showed no significant improvement; the patient remained unconscious, although slight movement was observed in the lower extremities. During treatment, the patient developed several nursing problems, including decreased cerebral tissue perfusion, impaired breathing pattern, decreased level of consciousness, risk of aspiration, risk of infection, and impaired skin integrity.

Despite comprehensive medical and nursing management, the patient's condition continued to deteriorate. The family declined cardiopulmonary resuscitation (CPR). The patient was pronounced dead on January 25 at 13:00 WIB.

CONCLUSION

Based on the assessment findings and the patient's clinical course, it can be concluded that the patient experienced a hemorrhagic stroke (caused by the rupture of a blood vessel in the brain) with a diagnosis of intracerebral hemorrhage (ICH) in the right basal ganglia, accompanied by intraventricular hemorrhage (IVH) and cerebral edema. The bleeding within the deep brain tissue led to increased intracranial pressure, decreased cerebral tissue perfusion (reduced blood flow to the brain), and a progressive decline in the level of consciousness, eventually resulting in coma.

Despite undergoing decompressive craniectomy and receiving intensive care management, the patient's neurological condition did not show significant improvement. Extensive brain tissue damage, along with associated complications, resulted in neurological failure and deterioration of vital functions. Ultimately, the patient was pronounced dead on January 25 due to complications of severe hemorrhagic stroke.

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