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Monitoring 30° Head Elevation to Enhance Cerebral Perfusion in Traumatic Brain Injury Patients

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ABSTRACT

Introduction: Traumatic Brain Injury (TBI) is one of the critical conditions that requires quick and appropriate treatment to prevent further damage to brain tissue. One non-invasive approach that can be applied is a head elevation of 30°, which is believed to increase cerebral tissue perfusion and reduce intracranial pressure. This study aims to evaluate the effectiveness of monitoring and the application of 30° head elevation in improving cerebral perfusion in patients with captive trauma.

Research Methodology: This study uses an observational design with a pre-post test approach. The study subjects were patients with capitis trauma who performed a 30° head elevation action. Parameters observed before and after the intervention included the Glasgow Coma Scale (GCS), blood pressure, body temperature, pulse, pain, frequency of vomiting, nausea intensity, and dizziness level.

Result: After applying a head elevation of 30°, the patient's GCS remained stable at a value of 15 (Coma Scale). Body temperature decreased from 38.6°C to 36.8°C, and pulse rate from 118x/min to 80x/min. The pain scale decreased from 8 to 3, vomiting from 5x/day to 1x/day, nausea from a score of 5 to 1, and dizziness from a score of 4 to 1. Blood pressure did not change significantly (140/90 mmHg).

Conclusion: The application and monitoring of 30° head elevation are effective in increasing the perfusion of cerebral tissue and lowering clinical symptoms related to capitis trauma. This intervention can be used as the first step in the nursing management of TBI patients.

Keywords: Cerebral perfusion; Head elevation; Monitoring; Traumatic brain injury; TBI management.

INTRODUCTION

Traumatic Brain Injury (TBI), or traumatic head injury, is one of the leading causes of disability and death worldwide. According to the World Health Organization (WHO, 2023), more than 1.2 million people die each year from severe head injuries, with the highest incidence coming from traffic accidents (Cujkevic-Plecko *et al.*, 2023). In Indonesia, based on Riskesdas data in 2022, the prevalence of head injuries reached 11.9%, with Gorontalo Province recording the highest rate of 17.6%. Head injuries can involve the scalp (scalp), skull bones, and brain tissue and are classified on the Glasgow Coma Scale (GCS) into mild (GCS 13–15), moderate (GCS 9–12), and severe (GCS ≤8). Cerebral perfusion is a critical parameter in TBI management (Hudak *et al.*, 2024). Secondary brain injury, often resulting from increased intracranial pressure (ICP) and decreased cerebral perfusion pressure (CPP), can worsen the patient's neurological status and outcomes if not promptly addressed (Denchev *et al.*, 2023). Positioning strategies such as head elevation have been widely adopted in neurocritical care to reduce ICP and improve venous return, thereby enhancing CPP without compromising oxygenation (Chiu *et al.*, 2024).

One of the main challenges in treating TBI is overcoming cerebral tissue perfusion disorders due to increased intracranial pressure (ICT) and decreased cerebral perfusion pressure (CPP) (Agrawal *et al.*, 2025). Effective nursing interventions are needed to prevent brain hypoxia and wider tissue damage. One proven but straightforward and effective method for overcoming the increase in ICT is a head elevation of 30 degrees (Raith and Reddy, 2023). Studies show that this position can help improve cerebral venous flow, lower ICT, and maintain adequate CPP without significantly lowering brain oxygen saturation. Giving a 30° head position to patients with moderate to severe head injuries can increase awareness, lower blood pressure, and reduce complaints of pain, nausea, vomiting, and dizziness (Robbins *et al.*, 2025). This intervention also aligns with the principle of evidence-based practice in nursing, where clinical actions are selected based on the latest scientific evidence (Wells, Viaroli, and Hutchinson, 2024). Clinical biomarkers are crucial for diagnosing and predicting outcomes in patients with traumatic brain injury (TBI) (Kim *et al.*, 2025).

The novelty of this study lies in the systematic application and monitoring of 30-degree head elevation as a nursing intervention in treating cerebral tissue perfusion problems in capitis trauma patients, which is carried out measurably and continuously for three consecutive days in a hospital environment. Unlike previous studies, which are generally literature reviews or one-time observations, this study provides detailed data before and after the action every day, covering vital parameters such as GCS, blood pressure, body temperature, pulse, pain, nausea, vomiting, and dizziness. This research also focuses on the local context, namely on patients at Bhayangkara Hospital Makassar, which has not been widely studied in the national and international literature. With an in-depth case study approach, the results of this study can be a model for implementing evidence-based nursing practices to improve outcomes for patients with head injuries, especially in regional hospital settings in Indonesia.

This study focuses on implementing and monitoring 30° head elevation in a TBI patient to evaluate its effect on cerebral tissue perfusion. By analyzing clinical parameters such as GCS, blood pressure, heart rate, temperature, pain, nausea, vomiting, and dizziness before and after intervention, this research aims to provide evidence-based support for this critical yet straightforward nursing intervention. Although various studies show the benefits of a 30° head elevation, a comprehensive evaluation of its physiological

and clinical effects in local contexts, especially in hospitalized patients in Indonesia, is still limited. Therefore, this study aims to systematically evaluate the impact of a 30-degree head position on cerebral tissue perfusion in patients with capitis trauma at Bhayangkara Hospital Makassar.

RESEARCH METHODOLOGY

This research employed a descriptive case study approach, aiming to explore the effectiveness of 30-degree head elevation in improving cerebral tissue perfusion in patients with traumatic brain injury (TBI), particularly trauma capitis. A case study method enables a comprehensive understanding of the clinical condition, patient response, and outcomes following nursing intervention in a real-world hospital setting.

Study Design

A qualitative case study design was applied. The subject was a patient (Ms Z) diagnosed with trauma capitis who was admitted to the Merpati ward of Bhayangkara Hospital, Makassar. The intervention involved consistent monitoring and implementing head elevation at 30 degrees over three consecutive days.

Data Collection Techniques

Four primary methods were utilized to collect data comprehensively: Interview, to obtain subjective information regarding the patient's symptoms and complaints, such as dizziness, nausea, vomiting, and pain. Observation for ongoing monitoring of clinical symptoms and behavioral responses to the intervention. Physical Examination – including vital signs assessment (GCS score, blood pressure, pulse, body temperature). Documentation Review involving analysis of the patient's medical records, nursing notes, and treatment charts.

Intervention Procedure

The intervention consisted of positioning the patient's head at a 30° elevation by adjusting the head of the bed or using extra pillows, ensuring the patient's comfort and safety. This positioning was maintained for a minimum of 30 minutes per session and was repeated daily. The aim was to reduce intracranial pressure and improve cerebral oxygenation through facilitated venous drainage.

Evaluation Parameters

The patient's condition was evaluated before and after each intervention session based on the following clinical indicators: Glasgow Coma Scale (GCS), Blood pressure, Pulse rate, Body temperature, Pain scale, Frequency of nausea and vomiting, and Dizziness score. These parameters were measured daily for three days to monitor trends and determine the effectiveness of the intervention.

Ethical Considerations

Informed consent was obtained from the patient before the study. The research adhered to ethical principles in clinical care and data confidentiality as recommended by hospital research standards.

RESULT

Results of the Assessment

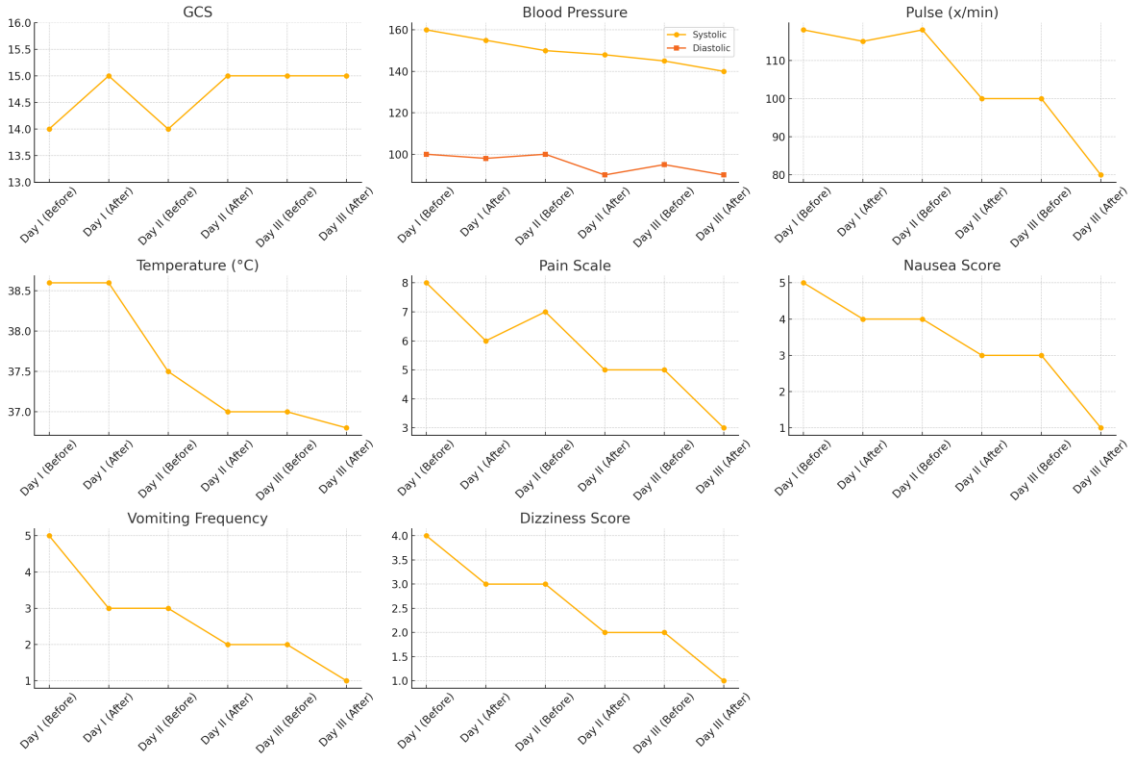
In the study, it was found that the data of captive trauma patients with the main complaints of Dizziness, nausea, and vomiting, the Client appeared conscious with GCS 15 (Coma), Physical Examination of vital signs 160/100 Mmhg, Temperature 38.60, Pulse 118/min, Breathing 20 x/min. The Client's main complaint history is that he slipped from the stairs and suffered a blow to the head, there was a wound on the right cheek, there was a nosebleed, the Client had fainted at the time of the incident, the Client felt a

headache in the back, mental status was good, memory was good. Laboratory examination of the patient's Complete Blood Test obtained WBC 8.50x10^3/PL /PL/PL/PL, RBC 5.60x10^3/PL /PL/PL/PL, HGB 17 g/dl, HCT 50.2%, PLT 4.40 10^3/PL. The therapy given to the patient is RL liquid infusion 20 drops/minute, Ranitidine / 12 hours/iv, Ketorolac / 8 hours, and Ceftriaxone / 12 hours.

Application of 30-degree head elevation intervention

The administration of head elevation action in patients with Capita Trauma with cerebral tissue perfusion problems was carried out by an intervention positioning the head 30 degrees, namely the position of the head raised 30° by raising the head of the bed or using extra pillows according to the patient's comfort for 30 minutes. An elevation of 30 degrees increases oxygen saturation and is a nonpharmacological therapy. However, the following are contraindicated in certain conditions: Carrying out an elevation of 30 degrees to prevent further complications, such as in hypotensive patients. Giving a 30° head position is the proper action in classifying moderate head injuries to launch oxygen perfusion to the brain to help improve the state of consciousness. The 30-degree head-up position is a position to raise the head from the bed at an angle of about 30 degrees, and the position of the body is in an aligned state.

Results of evaluation of the application of the 30-degree head elevation intervention



Charts 1. The following is a complete graph of the evaluation results of the 30-degree head elevation intervention for three days. Each graph shows gradual improvements in the patient's vital condition and subjective complaints.

The following is a graphical interpretation of the results of the evaluation of a 30-degree head elevation intervention for three days in patients with captive trauma: GCS (Glasgow Coma Scale). The graph shows an increase in GCS from 14 to 15 from the first to the third day. This indicates an improvement in the patient's level of consciousness

from a suboptimal condition to complete composure. This suggests that the intervention effectively enhances cerebral perfusion. Blood Pressure. Blood pressure (systolic and diastolic) gradually decreased each day: Systolic: from 160 → 155 → 150 → 148 → 145 → 140 mmHg, Diastolic: from 100 → 98 → 100 → 90 → 95 → 90 mmHg. This decline indicates that improved brain perfusion through head elevation helps reduce intracranial pressure and stabilizes the patient's hemodynamic status. Pulse. The pulse rate consistently decreased from 118 to 80 beats per minute. This reflects a relaxation effect and stabilization of the autonomic nervous system, suggesting a reduction in the patient's physiological stress after the intervention. Body Temperature. Body temperature decreased from 38.6°C to 36.8°C over three days. This reduction indicates that head elevation also assists in modulating the inflammatory response and alleviating mild hyperthermia caused by the brain injury pain Scale. Pain scores dropped from level 8 (severe) to level 3 (mild). This improvement highlights the success of the intervention in reducing intracranial pressure, which is often a significant cause of intense headaches in head trauma patients. Nausea Score. The nausea score significantly decreased from 5 (>6 hours) to 1 (no nausea). This suggests that gastrointestinal disturbances typically triggered by elevated intracranial pressure began to resolve. Vomiting Frequency. Vomiting frequency decreased from 5 times/day to just 1 time/day. This supports the hypothesis that elevated intracranial pressure stimulates the vomiting center, and head elevation effectively reduces this symptom. Dizziness Score. Dizziness scores dropped from 4 (lasting 5 hours) to 1 (no dizziness). This indicates improved oxygen circulation to the brain, reducing dizziness symptoms caused by hypoperfusion or increased intracranial pressure. All graphs show a consistent and significant trend of improving clinical status after a 30-degree head elevation intervention. These interventions have been shown to help stabilize vital signs, lower subjective symptoms, and increase cerebral perfusion effectively. Thus, this positional therapy is worthy of being used as a standard nursing measure in the treatment of patients with captive trauma.

DISCUSSION

The application of a 30-degree head elevation intervention in patients with captive trauma in the Pigeon Room of Bhayangkara Hospital Makassar showed positive results in increasing cerebral tissue perfusion and reducing clinical symptoms experienced by patients. The application of a 30-degree head position in patients with capitis trauma significantly impacted the improvement of cerebral tissue perfusion, evident from the various clinical parameters that improved during the three days of the intervention. A reduction in subjective symptoms such as pain, nausea, vomiting, and dizziness, and stabilization of vital signs suggest that a head elevation of 30 degrees may be an effective nonpharmacological intervention to manage intracranial pressure (ICT) (Tsigaras *et al.*, 2023). The application of a 30-degree head elevation position in patients with cerebral trauma has been shown to have a positive impact on increased perfusion of cerebral tissue as well as a reduction in clinical symptoms related to increased intracranial pressure (ICT) (Dobson, Morris, and Letson, 2024). The results showed that during the three days of the intervention, the patient's condition experienced significant improvement, both objectively (GCS, blood pressure, body temperature, pulse) and subjectively (pain, nausea, vomiting, and dizziness) (Jaradat *et al.*, 2025). Based on the evaluation results during the three days of the intervention implementation, there was a gradual improvement in the patient's state of consciousness, which was indicated by an increase

in the GCS score from 14 to 15 (Coma Scale). 30° head elevation can improve brain perfusion in patients with head injuries (Shi *et al.*, 2025).

Physiological parameters such as blood pressure and pulse rate also significantly decreased. Blood pressure decreased from 160/100 mmHg to 140/90 mmHg, and pulse rate from 118x/min to 80x/min (Kobata *et al.*, 2024). This reflects that the body is experiencing a relaxation response and stabilization of the autonomic nervous system (Hoyne and Edlow, 2025). A head elevation of 30° can lower blood pressure and improve mean arterial pressure without adverse effects on brain perfusion (Ritter, 2023). Gradual decreases in blood pressure and pulse frequency suggest that these interventions affect lowering physiological stress and improving patient hemodynamics (Singh *et al.*, 2024). This aligns with the principle that a reduction in ICT will reduce the load on the cardiovascular system and thus help stabilize blood pressure and heart rate (Lefebvre *et al.*, 2025). Increased cerebral perfusion contributes to the stabilization of the patient's hemodynamics. This decrease is also related to reduced physiological stress due to pressure inside the cranial cavity that begins to decrease (Zunino, Battaglini, and Godoy, 2024). Applying a 30-degree head-up position is simple, easy to perform, and does not require special equipment, but it significantly stabilizes the patient's condition (Suriyani *et al.*, 2023). This makes it an essential strategy in nursing practice, particularly in emergency and intensive care rooms (Kajiwara *et al.*, 2024).

In addition, subjective symptoms such as pain, nausea, vomiting, and dizziness also experience a consistent decrease every day. The pain score decreased from a scale of 8 to 3, vomiting from 5x/day to 1x/day, and dizziness from a score of 4 to 1. These results show that the position of the head elevation provides a comfortable effect and reduces pressure in the cranial cavity, thereby reducing central stimulation of pain and vomiting. A decrease in body temperature from 38.6°C to 36.8°C also indicates an improvement in the inflammatory process (Wart *et al.*, 2024). The body temperature that was originally high (38.6°C) decreased to 36.8°C on the third day. Although body temperature did not change significantly on the first day, the downward trend suggests that head elevation may play a role in reducing inflammation and mild hyperthermia due to brain injury (A, 2019). One of the main focuses of postoperative head trauma patient care is to prevent ineffective cerebral perfusion and acute pain. Regulating body position, including head position, is an essential strategy in nursing management to avoid complications (Payen *et al.*, 2023).

Thus, the 30-degree head elevation intervention proved to be an effective, safe, and easy-to-apply nonpharmacological measure to support the recovery of patients with head injuries. The results of this study can also be a reference for evidence-based nursing practice in dealing with cerebral tissue perfusion problems (Gkantsinikoudis *et al.*, 2024). This study confirms that nonpharmacological therapies such as head elevation are a safe, inexpensive, easy-to-apply intervention option and can be part of the standard protocol in the nursing care of patients with head injuries (Singh *et al.*, 2025). In addition, these measures can be implemented in various healthcare facilities, including those with limited resources, without the risk of significant complications (Parikh *et al.*, 2024).

Implications for Practice

The application of a 30-degree head elevation position should be part of the standard protocol in the treatment of patients with head injuries, especially in cases of capitis trauma with the risk of ineffective cerebral perfusion. In addition to being effective, this intervention is easy to do, does not require additional equipment, and has minimal complications. The findings of this study highlight the clinical value of

implementing a 30-degree head elevation as a simple, low-risk, and cost-effective nursing intervention for patients with head trauma, particularly those experiencing impaired cerebral tissue perfusion. This intervention can Improve neurological outcomes by enhancing cerebral perfusion and reducing intracranial pressure, Stabilizing vital signs such as blood pressure, pulse rate, and temperature, Reducing discomfort associated with symptoms like nausea, vomiting, dizziness, and headache, Serving as an early nonpharmacological strategy to prevent further neurological deterioration, Be easily integrated into standard nursing protocols and ICU/ER patient positioning guidelines, especially in resource-limited settings. Nurses should be trained to recognize the benefits and appropriate indications of this intervention, ensuring consistent and evidence-based patient positioning practices in cases of traumatic brain injury.

CONCLUSION

The implementation of 30-degree head elevation has proven to be an effective nonpharmacological nursing intervention for improving cerebral tissue perfusion in patients with head trauma. Clinical improvements observed include stabilized GCS (15), reduced blood pressure, lower body temperature, decreased heart rate, and alleviation of symptoms related to increased intracranial pressure, such as nausea, vomiting, dizziness, and headache. Given its effectiveness and simplicity, this intervention is recommended as a standard practice for treating traumatic capitis patients. Future research is encouraged to broaden the scope of outcomes and include larger sample sizes to enhance the generalizability of findings. This case study also provides a valuable reference for healthcare facilities in developing evidence-based protocols for managing cerebral perfusion issues in head injury cases.

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Conflict of Interest

There are no potential conflicts of interest relevant to this article.

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