EFFECTIVENESS OF 30^{O} HEAD ELEVATION INTERVENTION ON HEAD PAIN LEVELS IN PATIENTS WITH SPACE OCCUPYING LESION (SOL) INTRACRANIAL TUMOR POST-OP CRANIOTOMY : CASE STUDY

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ABSTRACT

Intracranial tumors are abnormal mass growths in the brain that originate from tissue that grows and divides uncontrollably. Space Occupying Lesion (SOL) is a space pressure caused by an increase in volume within the brain due to the accumulation of blood, cerebro-spinal fluid or brain tissue. A common treatment for intracranial tumors is craniotomy. According to research, about 60% of patients who undergo craniotomy experience moderate to high levels of headache pain. Non-pharmacological pain management that can be done includes deep breathing interventions with guided imagery techniques, monitoring patient hemodynamics and 30^{o} head elevation. The purpose of this study was to present the effect of 30^{o} head elevation nursing intervention on pain levels in patients with SOL intracranial tumors post craniotomy. The method in this study used a case study design conducted in November 2022 at Sumedang Regional General Hospital. The results showed that head elevation of 30^{o} can reduce head pain levels because it can maximize the entry of oxygen into the intracranial and increase the return flow of blood from the brain to the heart, help activate the parasympathetic nervous system which functions to control various activities of the human body at rest and maximize relaxed conditions in patients, resulting in a stable pulse frequency, respiratory frequency, blood pressure. The intervention of elevating the head position or head elevation of 30^{o} is one of the many nonpharmacological therapies that are useful for improving intracranial pressure so that the headache felt by the patient improves and cerebral perfusion can be resolved.

Keywords: SOL, Post-op Craniotomy, Head Elevation

INTRODUCTION

Intracranial tumors or brain tumors are abnormal mass growths within the brain that originate from tissues that grow and divide uncontrollably by body mechanisms. There are more than 150 types of intracranial tumors, but based on histopathology, intracranial tumors are divided into two broad categories; primary tumors and secondary tumors. Intracranial tumors are divided into two categories, primary and secondary tumors differentiated by the origin of the tumor, in primary tumors, the cells that become tumors come from brain cells, meninges, nerves, or glands while in secondary tumors the cells that become tumors come from malignant tumors of other

body tissues. The incidence of intracranial tumors is 10-17 cases per 100,000 individuals. Clinical symptoms of intracranial tumors include headaches, seizures, loss of consciousness, decreased motor and sensory nerve abilities (Aninditha, Nevada, & Sofyan, 2020).

Space Occupying Lesion (SOL) is a space pressure caused by an increase in volume within the brain (intracranial space) which includes blood, cerebro-spinal fluid and brain tissue that can increase intracranial pressure. SOL can be a neoplasm (growth) or hemorrhage (granuloma), overall will cause the development or expansion of intracranial fluid volume which then at that time causes expansion of intracranial pressure. Etiologies of SOL include genetic factors, history of head trauma, exposure to carcinogenic chemicals, viruses, immunologic deficiencies, and congenital defects (Mutiudin et al., 2020).

Craniotomy is a surgical procedure that involves opening a portion of the skull to identify and treat brain damage. Craniotomy procedures can be indicated in two conditions, namely in the presence of head injury and non-head injury. The most commonly recognized reasons for head injuries for which craniotomy is performed are brain detachment and brain injury. While the most common causes in cases of nonhead injury for which craniotomy is performed are brain growth or malignancy, brain aneurysm, and hydrocephalus (Suryadani, Hamzah, Rehatta, & Utariani, 2020). The width of a craniotomy usually ranges from a few millimeters to a few centimeters, depending on the condition and the treatment required. The tool used to perform a craniotomy is a knife that serves to open the brain cover (dura mater) by opening the part of the skull that has been cut. To see part of the brain, the durameter is also opened. The bone folds are reattached and tied to the head at the end of the procedure and of course the surgeon uses special equipment during the craniotomy procedure

In the postoperative stage of craniotomy, what clients need is how to reduce postoperative complications. Complications that usually occur after craniotomy are seizures, infection from the suture wound or surgical process, bleeding and hypovolemic shock, an increase in pressure in the brain and unbalanced electrolyte fluids. A widespread increase in intracranial pressure can be caused by post-craniotomy headache. This will result in hypoxia and decreased cerebral blood flow, both of which can cause irreversible cell death. If cell death has already occurred, it will cause edema in the necrotic area and cause intracranial pressure, further causing brainstem herniation which will likely lead to death.

Complaints of pain after head surgery are often overlooked and considered to have insignificant pain compared to pain from other procedures, so they are often ignored but nowadays the awareness of acute pain after craniotomy surgery is slowly changing assumptions. According to several prospective studies, approximately 60% of patients undergoing craniotomy suffer from moderate to severe headache after the procedure (Suwarman & Bisri, 2019). The existence of continuous head pain needs to be avoided by means of head pain management, this is important because head pain causes postoperative discomfort due to increased pressure and bleeding in the brain. Pain

management carried out needs to be considered according to the needs and abilities of the patient so as not to overdo it because it can cause sedation, when sedation occurs, nurses will find it difficult to identify new neurological problems and can hinder monitoring of neurological responses.

After craniotomy surgery with neuroanesthesia, the ideal treatment for acute pain should be pain-relieving, antiinflammatory, free from side effects such as the onset of local bleeding, nausea, vomiting, convulsions, not causing problems with the central nervous system, not causing respiratory and circulatory distress, not inhibiting neurological mechanisms. According to Pratama, Laksono, and Fatoni (2020) currently there are no drugs in this category. Therefore, in order to effectively treat head pain in patients who have undergone craniotomy, a combination of interventions is needed.

Head elevation is an attempt to make the head position higher than the body position. The theory of head elevation is based on the theory that the position of the limbs higher than the heart will help the fluid in the brain to be redistributed from the skull into the space between the skull and the spine (subarachnoid spinal) and facilitate blood return to the spine. An additional goal of this intervention is to improve patient oxygenation. Nugroho's research (2019) suggests that head elevation will increase blood flow to the brain and increase oxygen flow to brain tissue. A patient will relax and be able to divert his attention from the headache he is experiencing due to adequate oxygen supply, which will reduce his pain response.

Kusuma and Anggraeni's research study (2019) regarding the effect of 30º head elevation on head pain in 22 patients who suffered head injuries in one of Purwokerto Hospitals, explained that a 30º head elevation position can reduce head pain. The mild head pain scale in patients when given a 30º head elevation intervention which was originally 4.77 dropped to 3.36 with a difference in pain scale reduced by an average of 1.41. This condition is caused by the height of 30º from the head providing comfort that can reduce the pain experienced by patients, therefore researchers want to know how the 30º head elevation position affects the severity of head pain in patients after craniotomy surgery.

LITERATURE REVIEW

a. Intracranial Tumors

Intracranial tumors, also known as brain tumors, are abnormal masses of tissue inside the cranium, where cells grow and divide uncontrollably by the mechanisms that control normal cells. Intracranial tumors cause the onset of progressive neurologic impairment caused by focal disruption due to the tumor and increased intracranial pressure. Focal disruption occurs when there is pressure on the brain tissue, and direct infiltration or invasion of the brain parenchyma with neural tissue damage. Changes in blood supply due to tumor pressure cause necrosis of brain tissue and manifest as acute loss of function. Seizure attacks are manifestations of abnormal electrical activity associated with compression, invasion, and changes in blood supply to brain tissue.9,13 Some tumors also compress the surrounding brain parenchyma, exacerbating focal

neurological disorders.9 Increased ICP can be caused by several factors including increased mass within the skull, oedema formation around the tumor, and changes in cerebrospinal fluid. Tumor growth will squeeze the relatively fixed space in the skull. The mechanism of oedema formation in cancer is thought to be due to osmotic difference that causes absorption of brain fluid (Simamora & Zanariah, 2017).

b. Space Occupying Lesion (SOL)

Intracranial tumors fall under SOL. SOLs are substantial physical lesions, such as neoplasms, hemorrhages, or granulomas, that occupy space. Intracranial SOLs are defined as neoplasms, benign or malignant, primary or secondary, as well as hematomas or vascular malformations located within the cranial cavity. SOL provides signs and symptoms due to intracranial pressure, intracranial shift, or brain herniation, which can result in brain death (Suryadani et al., 2020).

c. Craniotomy

craniotomy operations such as skin incisions, installation of head support pins, periosteal-dural contact, dural closure, manipulation of bone and skin can cause various levels of nociceptive stimulation. The surgical procedure in craniotomy operations such as skin incisions, installation of head support pins, periosteal-dural contact, dural closure, manipulation of bone and skin can cause various levels of nociceptive stimulation (Ferdyansyah & Harahap, 2018).

d. 30o Head Elevation

30o head elevation position is a position to raise the head from the bed at an angle of about 30o and the body position is aligned. 30o head up position is as follows: put the patient in a supine position, set the head position higher and the body is flat, the legs are straight and not flexed, set the height of the upper bed as high as 30o . Things that need to be considered in. Setting the head up 30o position is flexion, extension and rotation of the head will inhibit venous return so that it will increase cerebral perfusion pressure which will affect the increase in intracranial pressure (Haryuni, 2017).

The ideal pain management after craniotomy should be able to relieve pain, have anti-inflammatory capabilities, not affect central nervous system function, not inhibit consciousness or neurological assessment, not cause cardiac and respiratory depression, not be addictive and not have side effects such as vomiting, nausea, epilepsy, or local bleeding. One of the non-pharmacological measures that can be taken is 30o head elevation. The purpose of this study was to present the effect of 30o head elevation nursing intervention on pain levels in patients with SOL intracranial tumors post craniotomy . The formulation of the problem and questions in this study is how the effect of 30o head elevation on head pain levels in patients after craniotomy with SOL.

RESEARCH METHODOLOGY

This research uses a case study design. A case study is a series of intensive scientific activities designed to gain a comprehensive understanding of an activity or event carried out by an individual, group, institution or organization to gain a comprehensive understanding of the event (Dwi Noerjoedianto, 2022). In this study, data collection was carried out in November 2022 for 19 days in the Jasmin Room of the Sumedang Regional General Hospital. The procedure for sorting information and data in this study is primary and secondary data. Primary data came from the physical examination of the patient while secondary data came from the patient's family and the patient's medical record. Agreement with the patient using informed consent signed by the patient and the patient's family. Narrative analysis was used to analyze the data that had been obtained.

Patient Information

Male Mr. R, 30 years old, Muslim, married, Sundanese, works as an iron construction service employee, high school education, lives in Rancamulya, Sumedang Regency, West Java Province 45354, came to Sumedang Regional General Hospital on November 11, 2022 escorted by his family and complained of pain in the surgical wound two weeks ago. On a scale of 1 to 10 the patient said the pain was felt on a scale of 6, the surgical wound pain was experienced on the right side near the ear, felt like throbbing and stabbing. The patient experiences pain almost every day, lasting less than an hour per day. The pain is worse when the patient is active and decreases when resting. Pain accompanied by vomiting (-) complaints of fever were denied. Physical examination

results composmentis consciousness (E4M6V5), temperature 36°C, pulse 89x/min, respiration 22x/min, blood pressure 100/70 mmHg, SPO2 97%. Anthropometric examination results body weight 48 kg, weight before illness 50 kg, height 160 cm, Body Mass Index (BMI) 19.5 kg / m2 (normal), Upper Arm Circumference (LLA) 22 cm (normal value: 23.5 cm). The results of a comprehensive physical assessment of the head, mouth, neck, heart and lungs had no problems and the assessment results were within normal limits.

According to the patient's statement, initially the patient often felt severe headache and dizziness since 2021. Then the patient did not take the initiative to see a doctor, to reduce the pain the patient bought stall medicine and did alternative medicine by drinking prayer water. About ± six months ago the patient often suddenly fainted, complaints of headache and dizziness were getting worse. The medicine that was often consumed from the stall was no longer able to reduce complaints of pain, so the patient went to the doctor to find out his condition and the doctor gave the patient medicine to consume. Since then, the patient has been going to the doctor regularly and taking the medicine recommended by the doctor every day, but the medicine consumed can only relieve headache pain temporarily. Then the doctor advised the patient to do a CT scan of the head and the results showed that there was a buildup of fluid in the patient's brain which caused intracranial pressure, after which the patient was required to take ventriculoperitoneal (VP) shunt action, which is a useful action to

improve or relieve intracranial pressure that occurs due to too much fluid in the brain. Fluid is drained through a catheter that is inserted through the head and then channeled and connected to the abdominal cavity. This catheter serves to reduce the buildup of brain fluid by draining the fluid into the abdominal cavity. One week after the VP shunt was performed, the patient again complained of head pain, according to the patient's statement, the pain was felt more intense, especially at the edge of the forehead, then the patient returned to the doctor and according to the doctor's advice the patient was advised to re-conduct a CT scan of the head. The CT scan results showed the presence of SOL with a picture of a solid mass in the cortical subcortical right frontotemporoparietal lobe that urged and narrowed the surrounding sulci corticalis, right fissura sylvit, ventricle 3, anterior cornu and temporal cornu of the right lateral ventricle and caused a midline shift as far as Ik. 0.57 cm to the left suggestive of a high grade astrocytoma dd/ glioblastoma multiforme. Based on the results of the overall examination of the patient, the doctor made a clinical diagnosis on the patient's condition, namely CSF Leak (Cerebrospinal Fluid Leak) Post Craniotomy Neuronal Tumor due to Space Occupying Lesion (SOL) Supratentorial Right Frontotemporal Low Grade Gliomas.

Nursing Interventions

Nursing care and interventions on the patient were carried out for nineteen days. The author assessed pain assessment comprehensively including pain location, characteristics, frequency, duration, and pain triggering factors during the first intervention. On a scale of 1 to 10 the patient reported pain on a scale of 6, the patient reported experiencing head pain characterized by throbbing pain that felt like stabbing throughout the head. The pain increased during activity but decreased during rest. The author conducted a comprehensive pain assessment every eight hours to ascertain the progressiveness of the headache pain to know what intervention to do next. The examination performed must be accurate and comprehensive, the aim is to get results that truly show the patient's condition.

Pharmacological interventions provided for patients include drug therapy paracetamol 4x1000gr / day via intravenous, ceftriaxone 2x1mg / day via intravenous, kalnex 3x250mg / day, acetazolamide 3x250mg / day, ranitidine 2x50mg / day via intravenous. Then the patient also received NaCl 0.9% fluid therapy 500ml/12 hours to maintain osmolarity in the blood and maintain hemodynamics which can increase intracranial pressure which can aggravate the patient's headache (Sokhal, Rath, Chaturvedi, Singh, & Dash, 2020).

Non-pharmacological interventions include hemodynamic monitoring, guided imagery deep breathing and 30o head elevation. Monitoring the patient's hemodynamics is checking vital signs (blood pressure, pulse, and respiration), saturation, and Mean Arterial Pressure (MAP), checking for side effects that may indicate reduced blood flow to the brain, such as migraines, dizziness, nausea, and weakness in the body, monitoring the patient's position and keeping the patient in the correct position, especially in sick or limited patients. According to Sokhal et al., (2020) changes in the patient's hemodynamics may

indicate an increase in intracranial pressure. The author monitored the patient's vital signs, saturation, and MAP. Calculation of the patient's MAP is done to determine how oxygen is supplied to the brain tissue, if there is an increase in MAP value or more than 100 mmHg, it indicates an expansion of the hematoma which is a condition that indicates an increase in intracranial pressure.

The next intervention is deep breath relaxation as a non-pharmacological therapy to reduce pain accompanied by guided imagery techniques, the author teaches patients to inhale through the nose slowly, then hold their breath for a few moments and imagine in their minds the scenes they like then exhale through the mouth gradually, this therapy is carried out according to the patient's ability. Then another intervention is to provide a 30o head elevation position adjusted to the patient's comfort by advising the patient and family to avoid the Valsalva maneuver, which is allowed to minimize straining when defecating and not too tight when you want to cough.

RESULTS

The intervention was completed on the nineteenth day the patient was treated and experienced a change in pain level, the patient said the pain was felt to be a scale of 3 (1-10), with pain still arising, throbbing pain in the right side of the head. The final assessment was carried out on the nineteenth day, there was no negative subjective data from the patient regarding complaints of head pain, clear communication even though it needed to be slow. Blood Pressure: 120/80 mmHg, Pulse: 86x/min Respiration: 18x/min Temperature: 36.20 C and oxygen saturation: 98%. During the nineteen days of hospitalization, the perfusion condition of the brain tissue showed a good reaction characterized by complaints of pain in the patient's head decreasing, and MAP was at the normal limit of 100 mmHg. However, it is still necessary to note the risk of ineffective perfusion of cerebral tissue again because head pain is likely to occur again due to intracranial pressure, so the patient is asked to reduce the valsalva maneuver.

DISCUSSION

Interventions for patients consist of pharmacological and non-pharmacological therapies. Pharmacological therapy given ceftriaxone is a cephalosporin class antibiotic to treat diseases caused by bacterial infections and is used to prevent infection during surgery. Paracetamol as an analgesic that can reduce and relieve mild to moderate pain and as an antipyretic that works to inhibit the production of prostaglandins, inflammatory substances that cause fever. In the hypothalamus part of the brain, prostaglandins can affect how the body regulates temperature. Then, kalnex is a drug containing 500 mg of tranexamic acid which belongs to the group of antifibrinolytics that help stop bleeding. Ranitidine is given to reduce peptic ulcers and diseases that occur due to increased production of stomach acid. Other management is supporting therapy in the form of infusion of NaCl 0.9% 20 tpm and mannitol as a therapy to overcome tension on the brain (intracranial pressure) and provide a way for cerebro spinal fluid to flow which can reduce intracranial pressure.

Non-pharmacological herapies given to Patient include hemodynamic monitoring, deep breath relaxation techniques accompanied by guided imagery techniques and 30o head elevation. The author teaches patients to inhale through the nose slowly, then hold their breath for a few moments and imagine in the mind the scenes they like then exhale through the mouth gradually, this therapy is carried out according to the patient's ability. This guided imagery deep breathing technique can fulfill the patient's oxygen supply and can stimulate endorphins and relax the body's muscles. According to Felix, Ferreira, Cruz, & Barbosa (2019) when the muscles of the body are relaxed, pain can be controlled and reduced.

The next intervention is head elevation of 30o, this intervention is expected to reduce pressure inside the brain in patients with head injuries. The process of returning blood from the brain to the heart is indirectly assisted by the condition of the head which anatomically makes the heart lower than the head and is assisted by gravity so that the backflow of blood from the head becomes easy so that it will help reduce intracranial pressure because the amount of fluid in the head cavity decreases and blood flow in the brain can run as expected and perfusion of brain tissue will be good and the head pain felt by patients can be. Head elevation of 30o is safe as long as the patient is not hypovolemic provided that the patient's bed position is parallel and the legs are straight or not bent, in the head elevated 30o adjusted to the patient's comfort.

According to Anggraini (2020) head position that can maximize the entry of oxygen into the intracranial and increase the return flow of blood from the brain to the heart is with a head elevation position of 30o compared to a straight head position or parallel to the anatomy of the heart it will cause increased blood flow to the brain. In patient, a 30o head elevation implementation was carried out for 30 minutes. Based on the analysis seen from the oxygen saturation for 30 minutes, the patient's condition is heading towards good development and the results of the oxygen saturation check increased from 95% to 98% and Mr.R looks improved and more comfortable in resting. Complaints of nausea and vomiting, headache, blood pressure instability are conditions caused by an increase in central venous blood volume, raising the head 30o helps increase blood flow in the jugular vein which can help reduce central venous blood volume which lowers intracranial pressure (Ginting, Sitepu, & Ginting, 2020).

The craniotomy procedure will activate the sympathetic nervous system which will activate the body's defense mechanism against a condition that is perceived as a threat or danger, the 30o head elevation intervention helps activate the parasympathetic nervous system which functions to control various activities of the human body while at rest, the function of the parasympathetic nerve is opposite to the sympathetic nerve, the parasympathetic nerve helps the body to be more relaxed (Abdullah, Herman, Thalib, & Nurhalisa, 2023). Head elevation of 30o can maximize relaxed conditions in patients, a comfortable position will stimulate the autonomic nervous system which in turn will send impulses to the neuroendocrine system which activates the parasympathetic nerves which are above the sympathetic nerves so as to produce

a relaxed condition that produces pulse frequency, respiratory frequency, helps relax muscles and stimulates brain alpha waves which produce a relaxed condition.

According to Mustikarani & Mustofa (2020) semi fowler position, high fowler position, or head elevation position can improve brain tissue perfusion. This position can affect the body's gas exchange process by facilitating blood flow to the brain and increasing cerebral oxygenation, the position of head elevation is very helpful in hemodynamic changes. Head positions with bed elevations of 15o, 30o and 45o have different tissue perfusion values than flat head positions (YaDeau et al., 2019). Other research according to Sands et al. (2022) head elevation position can increase oxygen saturation values although not very significant. Head elevation above 45o is not recommended because it can worsen ischemia in brain tissue which can cause a decrease in cerebral perfusion pressure.

According to research conducted by Kiswanto & Chayati (2021) head elevation positions of 0o and 15o can increase the body's oxygen saturation, but a head elevation position of 30o is more effective at increasing oxygen saturation than others. Head elevation 30o position can reduce tightness and can improve oxygen perfusion when patients experience a decrease in oxygen in the central nervous system caused by sudden disconnection of brain tissue. According to Riberholt et al. (2020) stated that each head elevation position can increase oxygen saturation even though the results of the change are not so significant and the 30o head elevation position increases the oxygen saturation value more than other elevation positions. Some literature shows that head elevation positions of 15°, 30°, 45°, and 90° can affect the increase in oxygen saturation values; however, in evidence-based nursing practice, the 30° position is better. Thus, the reference nursing intervention in increasing oxygen in the brain is to use 30° head elevation.

On the nineteenth day, a final evaluation was conducted. The patient did not complain of headache and appeared to be communicating, although it was a little difficult to pronounce. BP: 120/80 mmHg, N: 86x/min RR: 18x/min S: 36.20 C and SPO2: 98%. The mean systolic blood pressure was between 110 and 120 mmHg, and the mean diastolic blood pressure was between 70 and 90 mmHg, both within the normal range. After nineteen days of treatment and care, the risk of cerebral perfusion ineffectiveness experienced by the patient showed an adaftive response which can be seen from changes in signs and symptoms such as reduced headache, loss of nausea and vomiting and vital signs within normal thresholds. However, the reoccurrence of the above complaints may occur due to an increase in intracranial pressure so that the patient is strongly advised to avoid the Valsalva maneuver and take regular medication as recommended by the doctor.

CONCLUSION

Based on the results of a comprehensive examination conducted on patient, a medical diagnosis of CSF Leak (Cerebrospinal Fluid Leak) R was diagnosed with CSF Leak (Cerebrospinal Fluid Leak) Post Craniotomy Neuronal Tumor due to Space Occupying Lesion (SOL) Supratentorial Right Frontotemporal Low Grade Gliomas.

The presence of cerebral swelling and fluid accumulation that causes pressure on the brain is the main cause of ineffective cerebral perfusion and headache experienced by patients. The intervention of elevating the head position or head elevation of 30o is one of the many nonpharmacological therapies that are useful for improving intracranial pressure so that the headache felt by the patient improves and cerebral perfusion can be resolved. Nurses have the responsibility of providing the services and care needed by patients, one of which is by responding to the signs and symptoms of the patient and determining what to do about the signs and symptoms of the patient.

Recommendation

Head elevation of 30o can be used as an intervention option that can be implemented as a non-pharmacological therapy for patients experiencing head pain due to increased intracranial pressure. It is hoped that the Hospital can develop a standard operating procedure for 30o head elevation intervention as a reference that nurses can use when providing nursing implementation.

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