

## **Anesthetic Management in Cerebellopontine Angle Tumor Craniotomy with a History of Nasopharyngeal Tumor**

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### **ABSTRACT**

**Background:** Cerebellopontine angle (CPA) tumor is the most common type of neoplasm found in the posterior fossa. In this case report, we aim to describe the anesthetic management of craniotomy surgery in patient CPA tumor with a history of nasopharyngeal tumor.

**Case:** A 49 years old female patient, weight 58 kg, was admitted with the main complaint of headache, dizziness, her lips drooped to the right and her left eye could not close completely. The left extremity is weak, walk unsteadily, the vision in both eyes is blurry, the left hearing is decreased. There is a history of nasopharyngeal carcinoma from biopsy results in 2019. The patient is diagnosed with a CPA tumor, a craniotomy will be performed under general anesthesia, the patient is fasted for 8 hours before surgery, which was administration of premedication ondansetron 4 mg iv, dexamethasone 5 mg iv. Preemptive analgesia sufentanyl 15 mcg iv, thiopental induction 250 mg iv, muscle relaxant rocuronium 30 mg iv, fresh gas flow (FGF) 3 L/min, maintenance with sevoflurane gas 2%, rocuronium 20 mg/hour syringe pump, dexmedetomidine 20 mcg/hour syringe pump. Analgetics after surgery patient was given morphin 1 mg/hour syringe pump, paracetamol 3x1 gr iv. After craniotomy the patient condition improved, complaints before surgery decreased.

**Discussion:** In this cases report, patient with CPA tumor underwent craniotomy surgery under general anesthesia. During operation, in neuroanesthesia management is to maintained hemodynamic stability.

**Conclusion:** Anesthetic management of CPA tumor starts from pre-surgical evaluation, premedication, induction, durante position, anesthetic management and supervision. Anesthesia has a very important role in the overall management of these patients to obtain good surgical results.

**Keyword:** anesthetic management; cerebellopontine angle tumor; craniotomy; general anesthesia; hemodinamic stability

## INTRODUCTION

Tumors of the central nervous system account for almost 10% of tumors throughout the body, with 80% intracranial presentation and 20% spinal cord presentation. In America there are 35,000 new cases of brain tumors every year. The annual incidence rate of primary brain tumors is 7–19,1 and the mortality rate is 6 per 100,000 population. The highest incidence of brain tumors in children is in the 1st decade, while in adults aged 30-70 with a peak aged 40-65 years. Brain tumors or intracranial tumors are tumors that arise in the skull or have a space compression process. The most common tumor locations were in the parietal lobe (18.2%), others were spread across several brain lobes, suprasellar, spinal cord, cerebellum, brainstem, CPA and multiple.<sup>1,2</sup>

There are two main groups of brain tumors, namely primary and metastatic. CPA tumors are the most common type of neoplasm found in the posterior fossa, accounting for 5–10% of all intracranial tumors. Surgery on tumors in the CPA area is a difficult surgical procedure and can cause fatal complications, because CPA is a narrow area filled with vascular structures and nerve tissue. Although brain tumours are rare compared with other malignancies, they are responsible, in many cases, for severe physical and cognitive disability and have a high case fatality rate (13% overall survival at 5 years). The diagnosis is made by a combination of imaging and histological examination of tumour specimen. Contrast-enhanced magnetic resonance imaging (MRI) is the gold standard imaging modality and provides highly sensitive anatomical information about the tumor.<sup>1,2</sup>

Anesthetic management during tumor resection procedures is a challenge, due to the age of the patient and the variety of problems that arise. In adults, some posterior fossa tumors are acoustic neuromas, metastatic tumors, meningiomas and hemangioblastomas. Anesthetic management for posterior fossa surgery requires careful consideration and planning before anesthesia is performed. Such as how to maintain brain perfusion pressure, cardiovascular response to surgical manipulation and preventing complications.<sup>1,3,4</sup>

This case is interesting because it is full of challenges for both the neurosurgeon and the neuroanesthesiologist. How a neurosurgeon controls bleeding and produces better results. In neuroanesthesia management, the way to maintain hemodynamic stability is to maintain adequate cerebral perfusion pressure (CPP), reduce cerebral blood flow (CBF), maintain normal autoregulation, reduce cerebral metabolic rate of oxygen (CMRO<sub>2</sub>), maintain adequate cerebral delivery oxygen (CDO<sub>2</sub>), and make the brain tumor loose and relaxed.<sup>5</sup> In this case report, we aim to describe the anesthetic management of craniotomy surgery in patient CPA tumor with a history of nasopharyngeal tumor.

## CASE

A 49 years old female patient, weight 58 kg, was admitted with the main complaint of headache, since the end of August 2023, the patient also complained of dizziness, her lips drooped to the right and her left eye could not close completely. The left extremity is weak, walk unsteadily, the vision in both eyes is blurry, the left hearing is decreased. There is a history of nasopharyngeal carcinoma from biopsy results in 2019

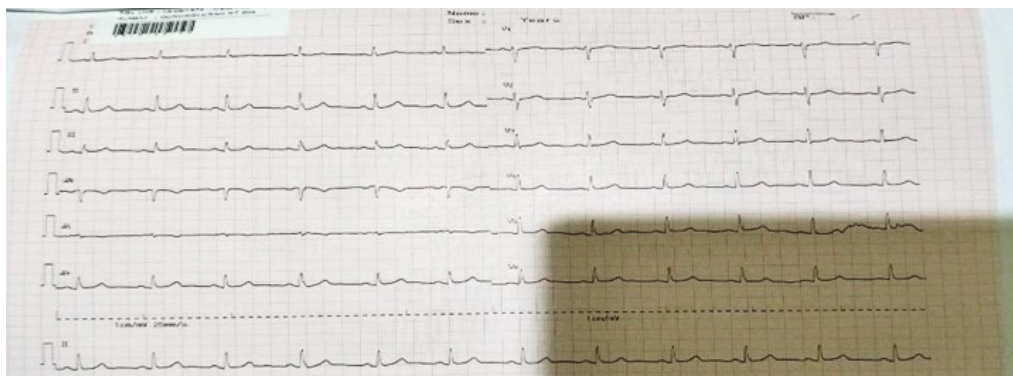
and has undergone chemotherapy 11 times and radiotherapy 35 times. Denied history of allergies, asthma, heart disease, diabetes mellitus and hypertension.

During the physical examination, we found that the general condition appeared to be moderate pain with awareness of glasgow coma scale (GCS), E4V5M6. On vital sign examination, blood pressure 96/62 mmHg, pulse 73 times/minute, regular, solid contents and pressure, respiratory rate 20 times/minute, SpO2 98% with room air, body temperature 36.7°C. In an anthropometric examination, a body weight of 58 kg and a height of 160 cm were obtained on inspection, with a body

mass index (BMI) of 22.7 kg/m<sup>2</sup>. On examination of the head, the impression of mesocephalic, no anemic conjunctiva or icteric sclera was obtained; on examination of cavum oris found, the presence of missing teeth and malampati 2, no mass or enlarged lymph nodes in the neck were obtained. On thoracic examination, there is no lagging movement or retraction, and the lung and heart are within normal limits. Examination of the abdomen normal, hemiparese dextra. The patient is then carried out supporting examinations in the form of laboratory examinations (Table 1), ECG examination (Figure 1), thoracic x-ray (Figure 2) and MRI examination of the head with contrast (Figure 3).

**Table 1.** Pre operative laboratory test result

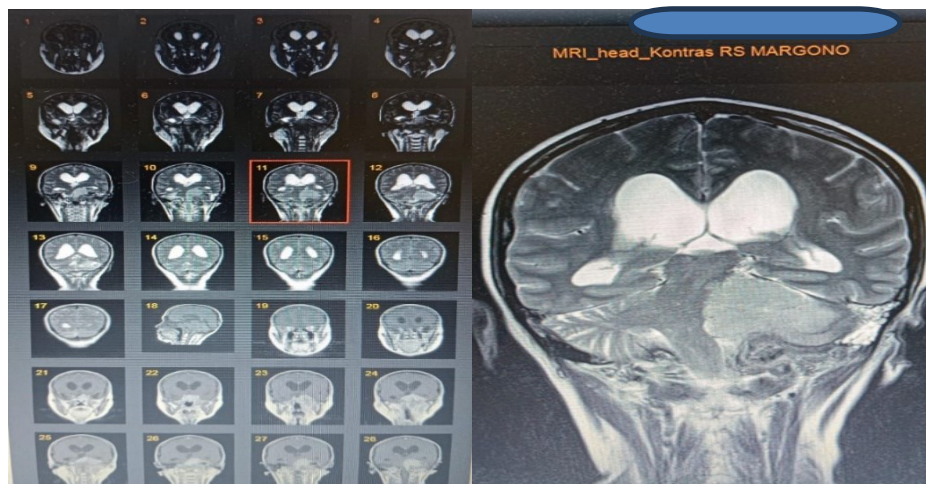
Laboratory test	Result	Normal value
Haemoglobin	12.8 g/dl	10.9 – 14.9
Hematocrit	38.8 %	34 – 45
WBC	6370/mm <sup>3</sup>	4790 – 11340
Platelets	286000/μL	216000 – 451000
Urea	29.4 mg/dl	15 – 40
Creatinine	1.12 mg/dl	0.0 – 0.9
PT	12.2 second	11.7 – 15.1
APTT	28.1 second	28.6 – 42.2
AST	19 U/L	<31
ALT	20 U/L	<31
Random glucose	97.7 mg/dl	80 – 139
Sodium	137 mmol/L	136 – 145
Potassium	9.7 mmol/L	3.5 – 5.1
Chloride	105 mmol/L	97 – 107
Hbsag	Non reactive	Non reactive



**Figure 1.** ECG examination



**Figure 2.** Chest x-ray



**Figure 3.** Brain MRI with contrast

The patient entered the operating room with pre-induced compliments consciousness, blood pressure 145/76 mmHg, pulse 78 times/min, respiratory rate 20 times/min, body temperature 36.6°C, and SpO<sub>2</sub> 100%. Patients were carried out under general anaesthesia using endotracheal tube (ETT) non-kinking no. 7.0 semi-closed breathing control system. Premedication with ondansetron 4 mg iv, dexamethasone 5

mg iv. Preemptive analgesia sufentanyl 15 mcg iv, thiopental induction 250 mg iv, muscle relaxant rocuronium 30 mg iv, fresh gas flow (FGF) 3 L/min, maintenance with sevoflurane gas 2% ratio of O<sub>2</sub> 60% and air 40%, volume tidal (VT) 400 ml, respiration rate (RR) 12 times/ min, minute volume (MV) 4800 ml, rocuronium 20 mg/hour syringe pump, dexmedetomidine 20 mcg/hour syringe pump.

Residual mass in the left CPA region which extends to the left petrous bone, destroys the clivus, extends to the bilateral sphenoid sinus, left nasopharynx, left pharyngeal mucosal space, left carotid space, and left perivertebral space with a size of 1x AP 4.6 x LL 7.3 x CC 4.3 cm, strong post contrast enhancement, which

compresses the left aspect of the pons and left cerebellum, narrows the 4 ventricle, obstructive hydrocephalus, increased intracranial pressure, bilateral ethmoiditis, bilateral mastoiditis, especially left.

The following is a hemodynamic chart of patient during surgery.

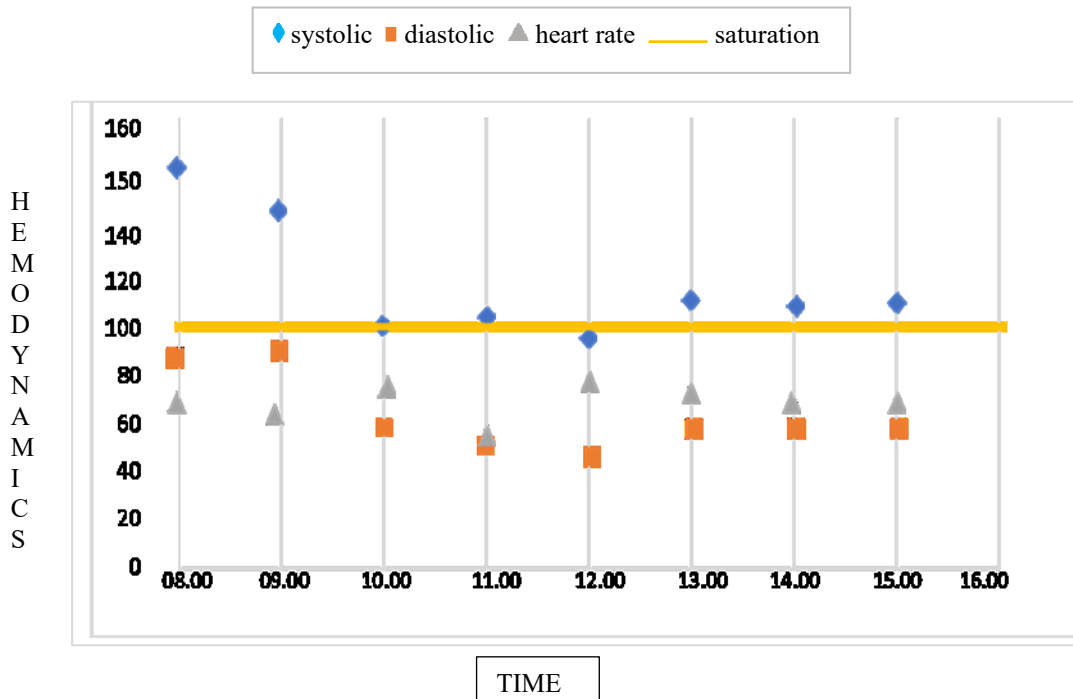


Figure 4. Vital signs monitoring chart intraoperative during surgery

The drugs given during surgery were induction with sufentanyl 15 mcg IV, lidocaine 80 mg IV, thiopol 250 mg. Previously, preoxygenation was carried out for 5 minutes 100% O<sub>2</sub>, installation of non-invasive blood pressure (NIBP) monitor, 3-lead ECG, SpO<sub>2</sub>. Intubation was facilitated using rocuronium 30 mg using a non-kinking ETT no. 7.0, tranexamic acid 1000 mg IV, vitamin k 10 mg IV, tramadol 100 mg. Maintenance is given sevoflurane with fresh gas flow 3 lpm, O<sub>2</sub> and water flow ratio 50%:50%, semiclosed breath control system, tidal volume 400 ml, RR 14 times/minute. Syringe pump (SP)

roculax 20 mg/hour, SP dexmedetomidine 20 mcg/hour. The fluids given during surgery were ringer lactate 3000 ml, Asering 500 ml, Nacl 300 ml, HES 500 ml, terastarsch 500 ml, manitol 100 cc, PRC 240 ml. Bleeding during surgery 1000 ml and urine output 5000 ml. During the operation, the patient was positioned prone, the surgery lasted approximately 8 hours. During surgery hemodynamics is always maintained in a stable condition (Figure 4).

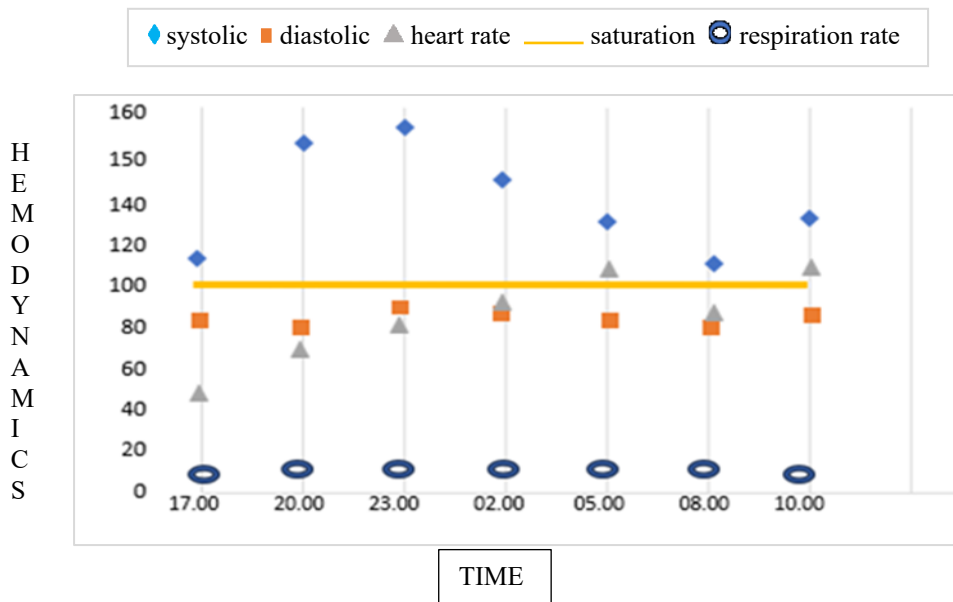
Post Operation

a. Patient enters the intensive care unit (ICU) on Oktober 16, 2023 at 17.00 WIB, patient discharged from the ICU on Oktober 17, 2023 at 10.00 WIB. Immediately after the operation is complete, the patient has a complete blood count, ureum, creatinine, albumin, electrolytes, albumn, blood

glucose laboratory examination for evaluation (Table 2). While in the ICU, the patient hemodynamics are closely monitored (Figure 5). Samples from the CPA tumor tissue were subjected to histopathological examination, and carcinoma metastases from the nasopharynx were found (Figure 6).

**Table 2.** Post operative laboratory test results

Laboratory test	Result
Haemoglobin	13.7 g/dl
Hematocrit	41.7 %
WBC	29100/mm <sup>3</sup>
Platelets	245000/μL
Urea	26.6 mg/dl
Creatinine	0.96 mg/dl
Albumin	3.78 g/dl
Random glucose	298 mg/dl
Sodium	136 mmol/L
Potassium	3.8 mmol/L
Chloride	103 mmol/L
Calcium	8.05 mmol/L



**Figure 5.** ICU hemodynamics monitoring chart

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Nama	[REDACTED]	No. Transaksi	2310120140
Alamat		Umur	49 Tahun
No. Pasien		Tgl. Terima	17-Okt-2023
Nama Ibu Pengirim		Tgl. Jawab	20-Okt-2023
Ruang Rawat		Jns. Kelamin	Perempuan
HASIL PEMERIKSAAN HISTOPATOLOGI			
Nomor PA	J.RSMS.23.8057	Diagnosa Klinis	Metastase Ca Nasofaring DD Cliv
<b>ORGAN</b>	: Serebellum		
<b>MAKROSKOPIS</b>	: Potongan-potongan jaringan terbesar ukuran 3 x 2 x cm, coklat kehitaman 2 kupe.		
<b>MIKROSKOPIS</b>	: Potongan jaringan menunjukkan sel-sel epitelial atipik, bulat, oval, pleiomorfik inti, hiperkromatin, mitosis dapat ditemukan. Stroma jaringan sembab hiperemis bersebukan sel radang kronik disertai fokus-fokus perdarahan.		
<b>KESIMPULAN</b>	: Otak (clivus), operasi : Metastasis carcinoma (Karsinoma sel squamosa non keratin of Nasofaring).		
<b>SARAN</b>	:		
<b>CATATAN</b>	: Pasien dengan Riwayat pemeriksaan PA : Th 2020 No. PA J.RSMS.20.492 Nasofaring karsinoma sel squamosa non keratin. Th 2021 No. PA J.RSMS.21.3500 Nasofaring : masih ditemukan sel tumor viabel. Th 2022 No. PA J.RSMS.22.7169 Nasofaring : Respon kemoradiasi kurang.		
		Purwokerto, 01-11-2023 Dokter Yung Mepanika <b>LABORATORIUM PATOLOGI ANATOMI</b> LIZA SURYANI D.drSp.PA,MSi,Med	

Figure 6. Histopathology examination result

**Histopathology examination result:**

**Organ:** cerebellum

**Macroscopic:**

The largest pieces of tissue measured 3 x 2 x cm, two kupe blackish brown.

**Microscopic:**

Tissue sections show atypical epithelial cells with round, oval, pleiomorphic nuclei. Hyperchromatin and mitoses are present. Hyperemic swollen stromal tissue with chronic inflammatory cells and areas of bleeding are also observed.

**Conclusion:**

Brain (clivus), surgery: Metastatic carcinoma (Non keratinized squamous cell carcinoma of the Nasopharynx).

**Notes:**

Patient History with PA examination:

Year 2020 No.PA J.RSMS.20.492 Nasopharyngeal non-keratin squamous cell carcinoma.

2021 No PA J.RSMS.21.3500 Nasopharynx: Viable tumor cells found in the nasopharynx.

2022 No. PA J.RSMS.22.7169 Nasopharynx: Poor response to chemoradiation.

Therapy given during treatment in the ICU, ceftriaxone 2x1 gr iv, ranitidine 2x50 mg, paracetamol 3x1 gr iv, phenytoin 3x100 mg, dexametason 3x2.5 mg, Syringe pump morphin 1 mg/hour.

After craniotomy surgery, the clinical patient condition improved and complaints before surgery decreased (Figure 7).



Figure 7. Patient's appearance after surgery

b. Ward care

Therapy given during treatment in the ward, ceftriaxone 2x1 gr iv, ranitidine 2x50 mg, paracetamol 3x1 gr iv, phenytoin 3x100 mg, dexametason 3x2.5 mg, sucralfate Syr 4x10 cc. After being

treated in the ICU, the patient's condition and hemodynamics in the room continued to improve until the patient was declared able to be outpatient by the doctor (Figure 8).

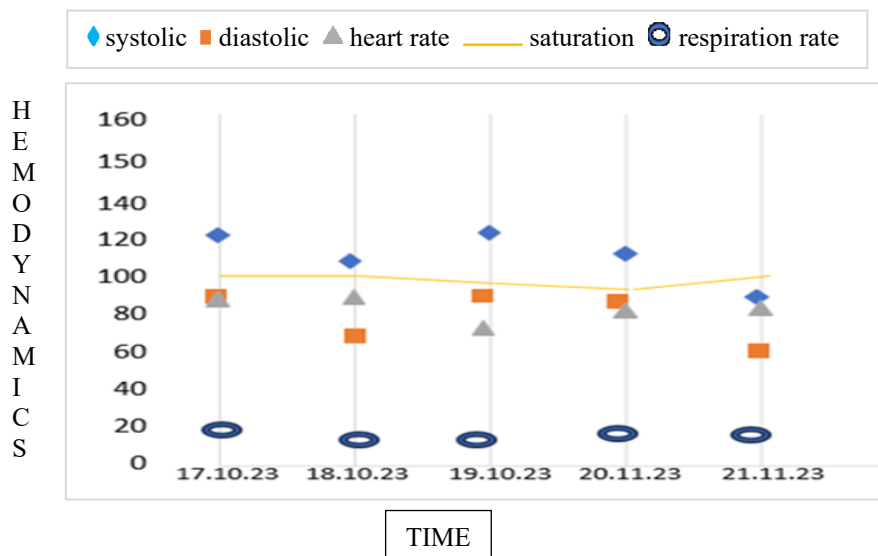


Figure 8. Ward care hemodynamics monitoring chart



## DISCUSSION

Between 5 and 10% of all intracranial tumors are located in the CPA. The most common tumors at the CPA are vestibular schwannoma, meningioma, and epidermoid tumors. Even though the primary intracranial melanomas in the primary CPA region are sporadic but when present can express with severe symptoms of ataxia, hearing loss, and dysphagia. Cerebellopontine angle (CPA) is a triangular space in the posterior cranial fossa that is bounded by the tentorium superiorly, brainstem posteromedially and petrous part of temporal bone posterolaterally. It is an important landmark anatomically and clinically as it is occupied by the CPA cistern, which houses the cranial nerve V, VI, VII, and VIII along with the anterior inferior cerebellar artery. Presenting symptoms can vary according to the size and location of the lesion. Cerebellopontine angle (CPA) tumors can be broadly classified into two types; those arising from structures located in the CPA, and those extending from adjacent regions into the CPA.<sup>6,7</sup>

Patient physical status, particularly in reference to cardiovascular and pulmonary stability and airway manageability, is a determinant of the choice of patient position for posterior fossa surgery. Surgical access to the posterior fossa can be obtained through various patient positions, such as the sitting position and variants of the horizontal position, which include supine retrosigmoid, prone, three-quarter prone, and park bench lateral positions. The goals of monitoring are to ensure adequate central nervous system perfusion, maintain cardiorespiratory stability, and detect and treat air embolism.<sup>8</sup>

The position for CPA surgery in this patient is the lateral position. The lateral position is used to approach lesions that are not in the midline, especially CPA. The lateral position is very suitable for approaching the CPA area. In addition, in this position the surgical operator can access areas that are affected by lesions such as the cerebellar hemisphere, clivus, petrous ridge and foramen magnum. However, this position is mostly used for unilateral neurosurgical procedures in the posterior fossa. The disadvantage of this position is the possibility of popliteal nerve paralysis due to inadequate padding in the fibula area. Apart from that, the use of an axillary roll must be appropriate in order to protect the nerve and vascular structures in the axillary region.<sup>8</sup>

The anesthetic management of these patients must take all of these factors into account, as patients with dangerously elevated intra cranial pressure (ICP) preoperatively must be treated with great caution, sometimes requiring preoperative CSF diversion and dexamethasone. Surgery for intracranial tumors can be safely accomplished with a careful preoperative evaluation and a smooth induction, maintenance, and emergence regimen. Preoperative assessment should include an understanding of the lesion site and dimensions, plan for surgical approach, neurologic symptomatology, ICP concerns, and medical comorbidities. Anxiolysis with benzodiazepines must be carefully considered, as even small increases in PaCO<sub>2</sub> in otherwise asymptomatic patients can quickly lead to dangerously elevated ICP due to increased intracranial elastance. Steroids and anticonvulsants should be continued, and in many cases supplemented, prior to and during craniotomy.<sup>9</sup>

Hemodynamic instability during any part of the anesthetic should be minimized due to the possibility of impaired autoregulation in peritumoral brain parenchyma. Hypertension can increase the risk of bleeding and exacerbate brain edema: intravenous anesthesia that can reduce ICP and CBF from induction drug, significant hemodynamic changes were lower after thiopental administration. Thiopental is one of the intravenous anesthetics derived from barbiturates. The onset of action of this drug is very short. Also, intravenous administration of thiopental doses may result in decreased blood pressure and elevation of the heart rate. In high doses, thiopental will cause a decrease in arterial pressure, recurrence and cardiac output. Lidocaine (1 to 1.5 mg/kg) may be given intravenously to blunt the hemodynamic and ICP response to laryngoscopy.<sup>9,10</sup>

By administering sufentanil as an analgetic, since sufentanil is an opioid that has a rapid onset and analgesic potential, for example, compared to fentanyl, intravenous sufentanil is 5-10 times more potent. This efficacy is mainly due to its high lipid solubility and ability to cross the blood-brain barrier. Muscle-paralyzing drugs are known to increase CBF, but the agents that increase CBF the least are vecuronium and rocuronium, thus becoming the drug of choice for neurosurgical operations. Patients weight 58 kg were given 30 mg of rocuronium in this case. Rocuronium was chosen in this case because it is a competitive muscle-paralyzing drug with the fastest onset of action, 2-3 minutes, with a medium duration of action. Rocuronium has minimal cardiovascular effects. At high doses, rocuronium has a mild vagolytic effect. Rocuronium is eliminated in the liver and, to a small extent, in the renal. In this

case use dexmedetomidine causes dose dependent sedation anxiolysis and some analgesia and blunts the sympathetic response to surgery and other stress. Most importantly, it has an opioid-sparing effect and does not significantly depress respiratory drive; excessive sedation, however, may cause airway obstruction. The drug is used for short-term (<24 h), intravenous sedation of mechanically ventilated patients. It has also been used for intraoperative sedation and as an adjunct to general anesthetics.<sup>11,12</sup>

During operation maintenance with sevoflurane, it causes slight increases in CBF and intracranial pressure at normocarbida, although some studies show a decrease in cerebral blood flow. High concentrations of sevoflurane (>1.5 MAC) may impair autoregulation of CBF, thus allowing a drop in CBF during hemorrhagic hypotension. Th is effect on CBF autoregulation seems to be less pronounced than with isoflurane. Cerebral metabolic oxygen requirements decrease, and seizure activity has not been reported.<sup>12</sup>

The aim of fluid therapy is to stabilize hemodynamics, prevent hypovolemia, hypervolemia, hyposmolemism, hyperglycemia. During the operation, there was quite a lot of bleeding, but with good resuscitation a stable condition without hypovolemia could be achieved. Apart from that, it is also to maintain the stability of the cardiorespiratory system and detect the occurrence of air embolism. Monitoring or supervision during the surgical period aims to ensure adequate perfusion of the central nervous system. Things that must be monitored intraoperatively are cardiovascular reflexes, namely stimulation of the floor of the IV ventricle causing medullary reflexes or trigeminal reflexes which cause hypotension and bradycardia.<sup>1</sup>

Adequate vascular access (usually two large-bore peripheral intravenous catheters, and arterial catheter, and possibly a central venous catheter) is mandatory for brain tumor resection. Intra cranial pressure (ICP) and cerebral perfusion pressure (CPP) are of great concern throughout these procedures, and an arterial catheter is very helpful to monitor CPP closely while also allowing the titration of PaCO<sub>2</sub> by revealing its gradient with end-expired CO<sub>2</sub> via arterial blood gas measurement. After vascular access is established and any neuromonitoring modalities are applied, the Mayfield pins are usually applied to the skull. The hemodynamic response is similar to laryngoscopy, and optimal control of blood pressure must again be sought, often by using propofol, opioids, or short-acting  $\beta$ -adrenergic antagonists.<sup>9,10</sup>

Following intracranial tumour surgery, admission to an ICU is considered a common practice. Management in an ICU during the postoperative period allows a rapid detection of neurologic deterioration and maintenance of systemic and neurologic homeostasis. Major complications after intracranial surgery occur in 13–27% of patients. These complications may be neurologic, haemodynamic, metabolic or respiratory in nature. Major neurologic complications include postoperative haematomas, cerebral oedema and seizures, and should be differentiated from minor events, such as postoperative nausea and vomiting (PONV), pain and hyperglycaemia. However, there is a possible relationship between events. An event considered as moderate and easily treatable may precede a more severe one. Hypertension may lead to postoperative haematoma. Acute physiological changes during anaesthesia recovery (sympathetic activation, increase in

cerebral blood flow and intracranial pressure, shivering and coughing) may be responsible for intracranial complications.<sup>13</sup>

After elective craniotomy, ICU admission should be warranted to patients who show new neurological deficits, especially when these include reduced consciousness or deficits of the lower cranial nerves, or have surgical indication for delayed extubation.<sup>14</sup>

Several important things that must be considered after surgery are that the patient must be able to wake up immediately, so that an assessment of neurological function can be carried out immediately. Extubation planning is carefully considered to minimize coughing and straining to avoid sore throat, hypertension, tachycardia and increased ICP so that bleeding can occur. In this case, delayed emergence was carried out with several considerations, namely the operation took more than 7 hours, the amount of bleeding was large, anticipation of cranial nerve disorders related to the airway, so monitoring was needed in the ICU. Once deemed safe, gradual weaning and extubation facilitated by lidocaine are carried out.<sup>12,13</sup>

In the approach to the oncological patient, quality of life has become a parameter as important as other parameters characterizing the success of treatment. These days, it is treated on par with figures representing such data as overall survival, disease-free life, and life expectancy with a controlled disease. Brain tumor survival rates can vary depending on several factors, such as the type of brain tumor and its growth rate (aggressiveness), its size and location, the age and overall health of the person, and the treatment options available.<sup>15,16</sup>

## CONCLUSION

The cerebellopontine angle (CPA) is the most common type of neoplasm found in the posterior fossa. Brain protection anesthesia techniques use a combination of total intravenous administration (TIVA) and inhalation. Anesthetic management for CPA tumor requires careful consideration and is determined before anesthesia is carried out. Preparation for patients with CPA tumor is preoperative evaluation, premedication, induction, durable position, anesthesia management and monitoring. In neuroanesthesia management, very necessary to maintain stable hemodynamics, and make brain tumors lose and relax. Post-surgical management is considered to prevent hypoxemia or other threats of respiratory problems, detect heart muscle ischemia. The principle of brain protection in tumor surgery is to achieve relaxation of the brain and a decrease in ICP. Anesthesia has a very important role in the overall management of these patients to provide maximum brain protection management during surgery so as to obtain a successful surgical outcome.

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