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Case Report

Perioperative Management Patients with Meningioma C1-2

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Abstract

Removal of spinal meningiomas in cervical 1 and 2 has several problems, especially regarding the respiratory and cardiovascular systems. A woman, 33 years old, admit Santosa Bandung Central Hospital with complaints of weakness in her left hand and both legs since 4 months ago. Weight 50 kg, height 155 cm, blood pressure 146/102 mmHg, pulse rate 105 x/min, temperature 36.50C, SpO_2 98% with room air. At diagnosis of cervical myelopathy due to space occupying lesion (SOL) intradural meningioma suspect. Induction of anesthesia with fentanyl 100 mcg, propofol 60 mg, rocuronium 40 mg, ventilated with 100% oxygen and sevoflurane 3 vol% (1.5 MAC), before laryngoscopy-intubation repeated half the initial dose of propofol. The patient is intubated in an in-line position. Anesthesia maintenance with sevoflurane 1 vol%, oxygen: air 50%, dexmedetomidine continuous 0.4 mcg/kg per hour, and continuous rocuronium 10 mcg/kgBW/min. Ventilation is controlled with a tidal volume of 360 ml, frequency 14 times/min. Then the patient is positioned in the prone position. Post-surgery is admitted to the ICU and day 5 the patient can be discharged from the hospital. The effects of C1–2 spinal cord tumors can affect the respiratory and cardiovascular systems. Surgical trauma can aggravate the injury before recovery occurs, so it is necessary to do ventilation assistance and cardiovascular support before recovery.

Keywords: Cervical meningioma, perioperative management, anesthesia

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I. Introduction

Spinal meningiomas are relatively rare, accounting for about 3% of all central nervous system (CNS) meningiomas and 25–46% of all primary intraspinal neoplasms. Ninety percent of intradural extramedullary spinal tumors are meningiomas or schwannomas and constitute nearly 25% of primary spinal neoplasia.[1-4] Spinal canal meningiomas are the most common intradural spinal canal tumors in adults and account for 8% of all meningiomas. Patient presentations can vary greatly. Once diagnosed, these lesions are mainly treated with surgery, but depending on the location and pathological features, chemotherapy and radiosurgery may be required. Emerging modalities may represent adjuvant therapy.[3] Spinal meningiomas most commonly occur in the posterior, posterolateral, or lateral thoracic regions, followed by the anterior cervical and lumbosacral regions.[2] The main therapy is surgery, which can be performed in (a) the classic open microsurgical approach in most cases, (b) minimally invasive surgery (MIS), or (c) through endoscopic intervention.[5] The choice of the most appropriate surgical method can be challenging, especially in cases of aggressive meningiomas and in some difficult access tumors (for example, the location of the anterior to the spinal cord in the thoracic region).[2] In 2016, the European Association of Neuro-Oncology (EANO) issued its first guidelines on the diagnosis and treatment of meningiomas. Since then, the level of evidence for diagnostic

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and therapeutic decisions has increased in various fields. A number of reports on the molecular genetics of meningiomas from different WHO classes provide valuable insights into meningioma biology and clinical behavior. Data from controlled clinical studies are already available and a new WHO classification in 2021 reshapes the diagnostic approach to meningiomas.[5] Because the main therapy is surgery, anesthetic techniques and drugs for CNS surgery require spinal cord protection which can be done with ABCDE (regulation of airway, breathing, circulation, drugs and temperature/ environment). Surgery in the C1-2 area requires attention to postoperative management because of the possibility of disruption due to damage or edema of the C1 and C2 spinal cord that affect the respiratory and cardiovascular systems.

II. Case

History

The woman, 33 years old, admit Santosa Bandung Central Hospital with complaints of weakness in her left hand and both legs since 4 months ago. The complaint begins with neck pain such as tied and numb then weakness in the left hand since 4 months ago and radiates to weakness in both legs since 2 months ago. Complaints are getting worse and worse until the patient cannot walk. Complaints accompanied by defecation and urination disorders, unable to feel defecation and urination since 3 months ago. A history of fever, trauma, and shortness of breath is absent. Neck pain is felt more aggravated if the supine position, so patients usually sleep with a head up position of 300. History of hypertension is absent.

Physical examination

Body weight 50 kg, height 155 cm, blood pressure 146/102 mmHg, pulse 105 x/min, temperature 36.50C, SpO_2 98% with room air. Motor strength with Muscle Power Scale: right hand 4, left hand 1–2, right foot 3-4, left foot 1–2.

Laboratory test

Laboratory examination with parameters within normal limits. In normal antero-posterior (AP) thoracic imaging results, tachycardia sinus rhythm ECG 102 times per minute. ECG picture within normal limits.

MRI scanning of cervical spine area axial-sagittal T1-weighted image (WI), axial-sagittal-coronal T2-WI, sagittal T2-FS followed by post contrast scanning axial-sagittal-coronal T1-Fat Saturation (FS). Clinical: Suspect cervical myelopathy. It appears that the isointense mass is firmly and evenly bounded at T1WI and gives an increased signal at T2-W and T2-FS in the anterior intradural region as high as cervical vertebrae 1-2 with a size of 2.01 x 1.59 x 2.65 cm. The mass presses against the spinal cord from the anterior direction causing spinal canal stenosis in this area accompanied by an increased signal in T2-WI. Post contrast mass scanning provides a powerful and homogeneous enhancement. Invisible the presence of mass expansion into the neurophorame region. Curve v. cervicalis is straight with good aligment. The intensity of v. cervicalis and v. thoracalis signals entering the scanning area is still within normal limits. The cervicalis intervertebral discs are still within

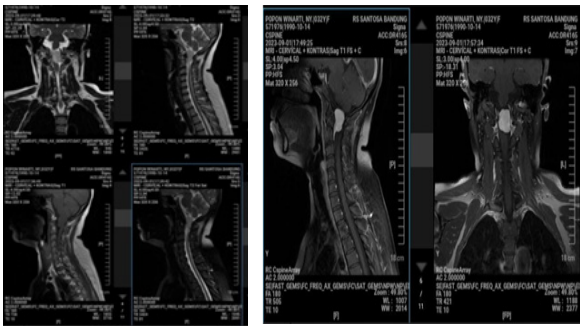


Figure 1. MRI Cervical Spine Preoperative

normal limits. The anterior-posterior longitudinal ligament, flavum, spinosum and interspinosum are within normal limits. The right and left paraspinal tissues are still within normal limits. Conclusion of MRI examination: Meningiomas as high as cervical vertebrae 1-2 (size + 2.01 x 1.59 x 2.65 Cm) urgent. The spinal cord is from the anterior direction and causes spinal canal stenosis accompanied by signs of myelopathy in this area.

Diagnosis

Dx cervical myelopathy due to space

Table 1. Laboratory Test

Test	Result	Unit	References Range
Routine Blood Count			
Hemoglobine	12.5	g/dL	11.7-15.5
Erythrocyte	4.43	Mil/uL	4.10-5.10
Haematocrite	37	%	35-47
Blood Index			
MCV	83.1	Fl	80.0-97.0
MCH	28.2	Pg	27.0-31.0
MCHC	34.0	g/dL	32.0-35.0
Leucocyte Count	12.05	Th/uL	3.60-11.00
Thrombocyte	348	Th/uL	150-450
MPV	10.5	fl	7.4-10.4
Coagulation			
Prothrombine time			
Prothrombine time	10.5	second	9.5-11.7
Control	10.9	second	
INR	1.03		
APTT			
APTT	26.9	second	23.0-31.9
Control	24.1	second	
Chemistry			
Blood glucosa at random	95	Mg/dL	55-180
SGOT (AST)	15	U/L	<32
SGPT (ALT)	8	U/L	<31
Ureum	9	Mg/dL	10-50
Creatinin	0.71	Mg/dL	0.51-0.95
Total Calcium (Ca)	10.1	Mg/dL	8.6-10.2
Sodium (Na)	139	Mmol/L	135-153
Potassium (K)	3.4	Mmol/L	3.5-5.3
Chlorida (Cl)	99	Mmol/L	98-109

occupying lesion (SOL) of suspected intradural meningiomas. Plan laminectomy tumor removal and posterior stabilization.

Anesthetic Management

The patient is positioned supine, neutral, head-up 300. When preinduction blood pressure 143/109 mmHg, pulse frequency 106 times per minute, oxygen saturation 98% with room air. Premedication dexmedetomidine bolus 1 ug/kg body weight given within 15 minutes followed by 0.4 mcg/kg per hour. Blood pressure drops to 139/103 mmHg, pulse rate 88 times per minute, oxygen saturation 98% with room air. Preoxygenation with 100% O2 is performed through the facemask. Induction of anesthesia with fentanyl 100 mcg, propofol 60 mg, rocuronium 40 mg, ventilated with 100% oxygen and sevoflurane 3 vol% (1.5 MAC), before laryngoscopy-intubation repeated half the initial dose of propofol. The patient is intubated in an in-line position. Anesthesia maintenance with

sevoflurane 1 vol%, oxygen: air 50%, continuous dexmedetomidine 0.4 mcg/kg per hour, and continuous rocuronium 10 mcg/kg/minute.

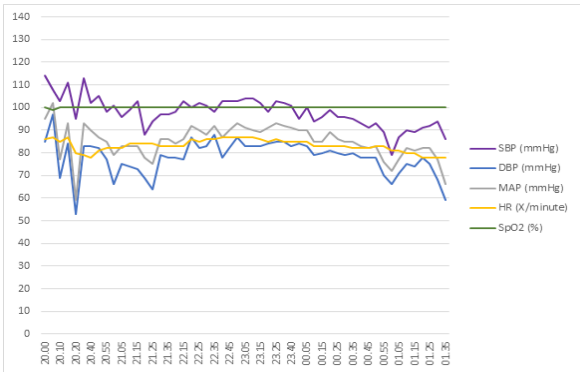
Ventilation is controlled with a tidal volume of 360 ml, frequency 14 times/min. Then the patient is positioned in a prone position (Figure 2), and surgery begins. Monitoring during surgery is carried out evaluation of systolic, diastolic, oxygen saturation, ECG waves and urine production through a catheter. The operation lasts 5 hours with the pronation position. The amount

Picture 2. Prone position

of bleeding is 300 cc, the administration of crystalloid fluid is 1500 ml, and diuresis is 400 cc. Surgery found a grayish-white tumor mass, a firm border attached to the anterior, bleed easily, and tumor resection was carried out as much as 50%. Postoperative analgetics with paracetamol 4 x 1 gram intravenously with dexmedetomidine sedation 0.3 mcg/kg per hour. The drug for spinal cord protection is given methylprednisolone 125 mg intravenously. At 2:00 a.m. the patient moved to the ICU.

Postoperative Management in ICU

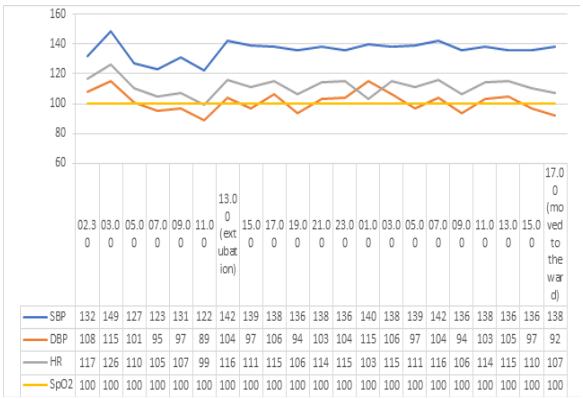
Post-operative, the patient is admitted to the Intensive Care Unit (ICU) for 1 day before moving to ward. On the first day in the ICU, the patient was admitted at 02.15 in ventilator control (control volume, FiO_2 50%, RR 14x/min, tidal volume 400, PEEP 5 and achieved tidal volume 412-455 mL, SpO_2 98-99%), with dexmedetomidine sedation 0.3 mcg/kg/hour, and weaning gradually until extubation at 13.00 noon. While in the ICU, patients receive fentanyl 25 mcg / hour and paracetamol 1 gram



Picture 3. Intraoperative Monitoring

Note: SBP = systolic blood pressure; DBP = diastolic blood pressure; MAP = mean arterial pressure; HR = heart rate; SpO_2 = peripheral oxygen saturation

/ 8 hours intravenously. Hemodynamics without support. Other therapies in the ICU include methylprednisolone 3x125 mg intravenously, tranexamic acid 3 x 500 mg intravenously, vitamin



Picture 4. Hemodynamic and SpO_2 at ICU

Note: SBP = systolic blood pressure; DBP = diastolic blood pressure; MAP = mean arterial pressure; HR = heart rate; SpO_2 = peripheral oxygen saturation

Table 2. Motoric Scale Preoperative and Postoperative

Score	Preoperative	Postoperative (day 4)
Right hand	4	4
Left hand	1-2	1
Right foot	3-4	3-4
Left foot	1-2	1

Note: 0 = no contraction; 5 = normal power

K 3 x 10 mg intravenously, natrium diclofenac 2 x 50 mg peroral, methylcobalamine 2 x 500 mcg peroral, amlodipine 1 x 5 mg peroral, and

pregabalin 2 x 75 mcg peroral. The patient was then transferred to a regular inpatient room and treated for 5 days before being discharged. Total fluids: crystalloid 1500 ml/24 hour.

Hemodynamic and SpO_2 at ICU.
Comparison of Motoric Scale preoperative and post operative. Post-surgery of the motor scale was measured on the 4th day (the patient was returned from the hospital on the 5th day).

III. Discussion

Surgery requires spinal cord protection. Spinal cord protection is carried out by basic methods, temperature regulation and pharmacological. In this case, the basic method is carried out by maintaining the airway, breathing and circulation.[6] During surgery patient in prone position. Prone position have several problems including nervous system, palsies, airway, pulmonary, cardiovascular and miscellaneous (table 3).[7] Monitoring during surgery and post-surgery in the ICU shows good SpO_2. During surgery the patient is intubated and respiration is controlled, as well as in the ICU. Airway and SpO_2 are in good condition. Circulation during surgery there is a slight fluctuation in the rise or decrease in blood pressure, but only transient and does not exceed 20% of the base line. Most spinal meningiomas occur in women older than 50 years (80%) and the most common location is thoracic (two-thirds of cases). They are usually benign tumors with slow growth, occupying the intradural extramedullary space; pure extradural tumors are very rare.1 Complaints will depend on the location of the tumor. In this case, the location of the tumor is as high as C1 and C2. The most frequent clinical findings are back pain, sensorimotor deficits and sphincter dysfunction. Advances in surgical techniques (microsurgery, ultrasonic dissection, perioperative monitoring) increase the rate of complete resection. The prognosis of surgically treated patients is satisfactory, even when the preoperative neurological status is poor.[1] Spinal meningiomas in younger patients have a worse prognosis than similar tumors in older patients.[9] Patients with an intradural tumor occupancy percentage of

Table 3. The Complication of Prone Position.[7]

Nervous system	
Cerebral ischemia	+
Cervical spine ischemia	+
Palsies	
Cranial nerves	++
Brachial flexus	++
Sciatic nerve	0
Peroneal nerve	0
Airway	
Edema of face, neck, tongue (postoperative obstruction)	++
Endotracheal tube migration	++
Pulmonary	
Ventilation/perfusion abnormalities	
Increase airway pressure	
Tension pneumocephalus	
Cardiovascular	
Hypotension	++
Dysrhythmias	++
Need for transfusion	++
Micellaneous	
Eye compression	+++
Compartment syndrome	0
Venous air embolism	++
Paradoxical air embolism	+

Note: 0, +, ++, +++ indicate relative probability from no risk to high risk

Table 4. MRC Muscle Power Scale

Score	Description
0	No contraction
1	Flicker or trace of contraction
2	Active movement with gravity eliminated
3	Active movement against gravity
4	Active movement against gravity and resistance
5	Normal power

Potter L. Neurological examination. Ocktober 28, 2023. GEEKYMEDICS.COM.[8] Assessment of muscle strength is an important part of the neurological examination of the upper or lower limbs. The MRC muscle strength scale uses a score of 0 to 5 to assess muscle strength

> 65% are more likely to have a preoperative symptom and deficit, validating previous findings. Therefore, we suggest that even in asymptomatic, otherwise fit, patients with tumor occupancy approaching 65% should be considered for surgery since there is a high risk of developing deficit with even minimal growth. Concerning recovery, patients with tumor both high tumor occupancy and significantly impaired function tended to improve their functional level postoperatively.[10] Benign spinal meningiomas should have always early diagnosis and microsurgical total resection for a good outcome. For semi-malignant or even malignant cases, radiotherapy should be considered.[11] Spinal meningiomas can be completely resected, are associated with postoperative functional improvement, and the rate of recurrence is low.[12] But in this case, motor scale assessment shows a slight worsening of the left leg and left hand but the condition relative similar with preoperative condition.

IV. Conclusion

The effects of C1–2 spinal cord tumors can affect the respiratory and cardiovascular systems. Position of patient during surgery have effect to several system including including nervous system, palsies, airway, pulmonary, cardiovascular and miscellaneous and surgical trauma can aggravate the injury, so it is necessary to protect system and the spinal cord. Protection of the spinal cord is carried out by basic method, temperature and pharmacological regulation. The outcome of the operation is relatively the same as in the preoperative state.

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