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ANESTHESIA MANAGEMENT IN MODIFIED PARK BENCH POSITION IN NEUROSURGERY : A CASE REPORT

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ABSTRACT

The modified park bench position enhances surgical exposure while minimizing brainstem manipulation but poses significant anesthetic challenges. This case report aimed to describe the author's anesthesia management in a modified park bench position for neurosurgery. A 39-year-old woman presented with intermittent headaches, nausea, and vomiting for three months, alongside vision deterioration. She denied loss of consciousness, seizures, weight loss, or trauma. Examination revealed typical vital signs, neurological function, and musculoskeletal integrity. Supporting tests showed elevated SGOT levels and a primary malignant brain tumor with suspected hemorrhage and surrounding vasogenic edema. She underwent craniotomy after fasting and standard anesthesia preparation. An arterial line, premedication, and intubation were administered, followed by five-hour surgery in the modified park bench position. Postoperatively, pain was managed with fentanyl, paracetamol, and ibuprofen. She was monitored in the ICU for seven days and discharged on the eighth postoperative day. In summary, managing primary malignant brain tumors like glioblastoma requires thorough preoperative assessment, precise anesthesia planning, and vigilant intraoperative monitoring for patient safety and successful outcomes. The collaborative effort of neurosurgery and anesthesia teams and postoperative care is vital for patient recovery and underscores the importance of comprehensive perioperative management.

Keywords ***:*** *anaesthesia, park bench position, modified, neurosurgery*

INTRODUCTION

Surgery is a medical procedure that involves physical action to correct or eliminate a health problem. Surgery can be performed for various reasons, from treating serious illnesses such as cancer, to repairing injuries or defects. The operation is usually performed in the operating room by a trained medical team, using special tools and sterile techniques to minimize the risk of infection. Before surgery, patients usually undergo a series of examinations and preparations to ensure they are in good condition to undergo the procedure (Anzai, 2022). After surgery, the patient will be closely monitored to ensure a smooth and safe recovery.

Proper surgical positioning is an important factor in the success of neurosurgery. The modified park bench position, which is a variation of the lateral position, is often used to achieve optimal access to the posterior fossa and cerebellopontine angle. This position offers advantages in terms of reduced brainstem manipulation and increased surgical exposure. However, this position also presents unique challenges for anesthetic management, as it can affect respiratory dynamics, cardiovascular stability, and the potential for increased intracranial pressure (Bharadwaj, 2023). Although the modified park bench position is widely used, the literature on anesthetic management in this position is limited aims to explore and describe effective anesthetic management strategies in the modified park bench position for neurosurgery. The results of this study are expected to contribute to a better understanding of anesthetic management in this position and improve clinical practice. The modified park bench position, a variation of the lateral position, offers several advantages in neurosurgery, especially for reaching the posterior fossa and cerebellopontine angle. This position allows good access to the area while minimizing manipulation of the brainstem, which is essential to avoid serious nerve damage. Apart from that, this position also helps maintain spinal stability and reduces pressure on internal organs. However, this position also poses some challenges, especially related to anesthesia management. The modified park bench position can affect respiratory dynamics, causing breathing difficulties and potential lung-related complications (Kianian, 2024). Additionally, this position can cause decreased blood flow to the heart, which can impact cardiovascular stability. Lastly, this position can increase intracranial pressure, which can lead to brain edema and neurological complications.

Proper anesthetic management is very important in the modified park bench position to maintain patient safety during surgery. Anesthesia must be tailored to the patient's specific needs and the risks associated with the position. The anesthesia team should closely monitor the patient's vital signs, including breathing, heart rate, blood pressure, and oxygen saturation (Yan, 2020). They must also be prepared to treat complications that may arise, such as decreased blood pressure, difficulty breathing, or increased intracranial pressure. The anesthesia team must work closely with the surgical team to ensure that the patient remains stable and safe during surgery.

Neurosurgical operations can be performed in different positions depending on the surgery location. The six principal positions related to these surgeries are supine, lateral (park bench), prone (three-quarter prone), and sitting positions (Vandiver, 2020). One variation of lateral position is the park bench position. The park bench position can be modified by pronating the patient's head and is usually used for accessing the posterior fossa and cerebellopontine angle. This position improves surgical exposure while reducing brainstem manipulation. This position affects physiological systems: respiratory dynamics are altered due to ventilation-perfusion mismatch, changes influence cardiovascular stability in venous return, and careful positioning is needed to avoid neck rotation and increased intracranial pressure (Ryalino, 2023).

The preoperative assessment focuses on airway evaluation, cardiopulmonary function, and documenting neurological deficits. Cervical spine neutrality must be maintained, and during induction, the airway must have advanced tools for the airway and secure the head and neck in an inline position if the patient has cervical instability or cervical trauma. We can use an arterial line, CVP, and capnography for intraoperative monitoring as mandatory. This case report aims to explain anesthesia management in a modified park bench position for neurosurgery in a patient with glioblastoma.

CASE PRESENTATION

A 39-year-old woman presented with complaints of intermittent headaches for the past three months, accompanied by episodes of nausea and vomiting. Her vision had also been deteriorating alongside the headaches. She denied any loss of consciousness or seizures. There was no history of weight loss, loss of appetite, or trauma. On examination, she weighed 39 kg and measured 150 cm in height, with a BMI of 17.3 kg/m². Her temperature was 36.7°C. She rated her pain as 0/10 at rest and during movement. Her neurological examination revealed a Glasgow Coma Scale score of EV45M6, with equal and reactive pupils. Other examinations were unremarkable.

No abnormalities were found based on laboratory examinations. Chest X-ray showed a prominent heart with a cardiothoracic ratio (CTR) of 52%. Fibrotic lines were observed in the upper zone of the right lung, along with irregular pleural thickening on both sides, suggesting an old inflammatory process. MRI of the head revealed findings suggestive of a primary malignant brain tumor with suspected hemorrhage (with varying ages of bleeding) in the right occipital to parietal lobes, accompanied by surrounding vasogenic edema. This tumor infiltrated the posterior horn of the right lateral ventricle, causing mild dilation of the posterior horn of the left lateral ventricle and the temporal horn of the right and left lateral ventricles, as well as a midline shift to the left by approximately +/- 0.8 cm and uncle herniation narrowing the basal cistern. Suspicion of glioblastoma multiform was noted. Subsequently, the patient underwent craniotomy for tumor resection, with a diagnosis of an intra-axial tumor in the right parietooccipital region and suspected glioblastoma.

Figure 1. Preoperative Condition of The Patient in The Park Bench Position

Figure 2. Position of The Patient's Head in A Pronation Position

The anesthesia procedure commenced with premedication consisting of 10 mg of intravenous dexamethasone, followed by the placement of an arterial line in the radial artery with local infiltration of 2% lidocaine, preceded by an Allen Test. Preoxygenation with 100% oxygen was performed for five minutes, and 150 mcg of intravenous fentanyl was administered. Anesthesia induction was initiated using propofol in TCI mode Eleveld with a target effect of 3-4 μg/mL, followed by administering 30 mg of rocuronium and 80 mg of lidocaine intravenously before intubation. Intubation was facilitated using a McGrath video

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laryngoscope with a size 3 blade, utilizing a 6.5-cuffed non-kinking endotracheal tube (ETT). The placement of the ETT was confirmed by bilateral symmetric auscultation. Following confirmation, the ETT was secured, an oesophageal temperature probe was inserted, and packing was applied. A 7 Fr central venous catheter (CVC) was also inserted into the right internal jugular vein.

After we anesthetize the patient, we deepen the anesthesia and We give some give eyes with thick gauze, and position the patient to a modified park bench position, to facilitate better access to the posterior aspect of the head. First, we positioned to the left lateral position and gave some padding between the knees, and the left arm support with some modified clothes to support the left arm and flexed the elbow, to prevent further injury. After that, we carefully turned the head and pronated and held it while the operator secured it with a pinning head holder (Benham-Hermetz, 2021). A scalp block must be done before pinning the head. We give bolters to make the right arm hold it and not get to a pronated position and at the back we give some pillow or bolster and some secure pin to secure the patient. After finishing positioning the patient, the operation table will make the head up about 30 degrees.

Figure 3. Position of Arms

Throughout the operation, monitoring measures ensured adequate oxygenation using compressed air and propofol in TCI mode Eleveld, targeting an effect of 2-3 μg/mL. Standard monitoring protocols were maintained to keep EtCO2 levels within 30-45 cmH2O range and oxygen saturation between 96-100%. Additional medications included 8 mg of intravenous ondansetron, 1000 mg of intravenous tranexamic acid, and 400 mg of intravenous ibuprofen. The surgical procedure, lasting five hours, Postoperative pain management involved administering 300 mcg of fentanyl in 50 ml of 0.9% NaCl at a titration rate of 2.1 ml/hour, along with 1000 mg of oral paracetamol every eight hours and 400 mg of intravenous ibuprofen every eight hours. Following surgery, the patient was monitored in the intensive care unit (ICU) with mechanical ventilation for three days before being discharged on the eighth postoperative day.

Figure 4. Position of Backs

RESULTS AND DISCUSSION

A 39-year-old woman presented with intermittent headaches, nausea, vomiting, and deteriorating vision for three months. An MRI indicated a primary malignant brain tumor with hemorrhage and vasogenic edema in the right occipital to parietal lobes, infiltrating the right lateral ventricle. It caused mild dilation of the ventricles and a midline shift. The patient was suspected with glioblastoma multiforme. The patient underwent craniotomy for tumor resection. Anaesthesia involved premedication with dexamethasone, arterial line placement, preoxygenation, fentanyl, propofol, rocuronium, and lidocaine for intubation, confirmed by auscultation. An oesophageal temperature probe and a central venous catheter were also inserted. This patient is suspicious of increased intracranial pressure, so anesthesia management focuses on maintaining optimal deep anesthesia and maintaining the stability of the patient's vital signs with arterial line monitoring. After the anesthesia had been done, positioning the patient with a modified park bench position, which is the head position, was pronated. This position can help the neurosurgery assess the lesions in the posterior fossa and cerebellopontine angle (Ryu, 2021).

Modified-park bench position is placing the patient in a lateral position with one leg flexed and the other extended. The position of the head turns carefully until a pronated position and secured with the head holder. We must prevent nerve injuries and pressure injuries because of this position by giving the same pad in the area we suspected to be nerve injury and pressure, and we must avoid excessive flexion or extension of the head. Several things must also be considered when operating in the park bench position, such as respiratory, cardiovascular, and neurological system disruption (Spena, 2019). The respiratory system can be altered in this position and can cause ventilation-perfusion mismatch. Lateral decubitus position can cause reduced functional residual capacity and increase the risk of atelectasis caused by compressing the dependent lung. To prevent this complication we use lung-protective strategies. We add positive end-expiratory pressure (PEEP) to maintain alveolar recruitment and improve oxygenation to the body. Airway management in the pronated positions can increase the risk of airway obstruction and dislocation of ETT. Due to this risk, some tools such as video laryngoscope must be available. Arterial blood gases (ABG) regularly can be used to ensure adequate gas exchanges (Talebnejhad, 2024). The modified park bench position can disturb cardiac output and venous return to the patient by compressing the inferior vena cava and jugular vein, leading to hemodynamic instability. Additionally, head pronation may exacerbate these effects by impeding venous return and altering cerebrospinal fluid dynamics. Careful fluid and hemodynamic management is required to maintain stability. Supported by vasopressors or inotropes to ensure adequate perfusion. Due to this complication, Invasive monitoring must be done, and we can use arterial lines and central venous pressure monitoring (CVP) (Murselović, 2023). Therefore, strict monitoring must be carried out on patients, such as cervical spine neutrality, vital signs, and airway evaluation. In this patient, who has been positioned in the modified park bench position during the operation, regular maintenance and checks of the head position are conducted to prevent too extensive cervical flexion or rotation, which can affect the patient's physiological functions, such as respiratory dynamics, cardiovascular stability, and increased intracranial pressure (Figure 1).

During induction, maintaining cervical spine neutrality while securing the airway is critical. Advanced airway tools should be used for safe intubation without compromising the patient’s position (Aryabiantara, 2018). Patient positioning needs to be given some padding at the pressure point to avoid pressure and nerve injury. Monitoring at head position to avoid hyperextension or hyperflexion of the head that can cause increased intracranial pressure. We can use capnography, arterial line, and CVP for intraoperative monitoring. Balance anesthesia was used for this patient with IV agents, neuromuscular blockade agents, and multimodal analgesia for minimized opioid use (Balasa, 2020). Regular ABG assessments guide lung-protective strategies with appropriate PEEP. Fluid and hemodynamic management maintain euvolemia with vasopressors or inotropes. Mattress warmers can be used to prevent hypothermia, and constant vigilance prevents complications like air embolism and nerve injuries, ensuring patient safety throughout the procedure (Miller, 2019).

Anesthesia medication management in neurosurgery, especially in the modified park bench position, demands thorough preparation and precise administration to guarantee patient safety and ideal surgical settings. For general anesthesia, induction can be used propofol, etomidate, or thiopental (Meena, 2019). This agent has a rapid onset of CNS depression, which prevents increased intracranial pressure and is suited for neurosurgical procedures. In this case, we use propofol as an induction agent because we can precisely control the depth of anesthesia with TCI mode Eleveld, with a target effect of 3-4 mcg/ml (Marotta, 2021). The neuromuscular blockade agent must be used in anesthesia management and during intraoperative. For induction, muscle relaxants are used to facilitate endotracheal intubation and prevent the patient from responding to any stimulation that can make the patient move. Selection of neuromuscular blocker based on duration action and reversibility. Intermediate agents like rocuronium, atracurium, and vecuronium have a rapid onset and short duration of action and reversibility of drugs (Lee, 2024). Long-acting agents like vecuronium can be used for prolonged relaxation procedures. Reversible drugs for neuromuscular blockade agents for this case we sugammadex (Lanks, 2022).

Park bench modified must be alert to neurologic injury. Excessive neck rotation and flexion can disturb cerebral venous outflow, increase intracranial pressure (ICP), and compress and compromise cerebral perfusion. Pinning is used for the head holder to secure the head position without straining the cervical spine. For continuous neurological monitoring, we use ICP and frequently assess cerebral perfusion pressure (Kang, 2019). Comprehensive neurological assessment must be done before the neurosurgical procedure for the baseline data and can compare the neurological change after the operation. In this patient, we don't use ICP but regular asses of cerebral perfusion by normalizing MAP so the perfusion is still stable. Integrating a comprehensive neurological examination into the preoperative assessment ensures thorough patient care and enhances the ability to detect and address neurological complications promptly (Hidayat, 2018).

To maintain anesthesia, we use balance anesthesia, which is a combination of intravenous agents, and neuromuscular blockade agent. We use propofol TCI with eleveld mode target effect 3 mcg/ml, and rocuronium intermittent 10 mg every 30 - 45 minutes to maintain the depth of anesthesia and prevent patient movement during the operation. Intraoperative analgetic we use multimodal analgesia such as fentanyl and combine with NSAID and acetaminophen (Gasteiger, 2023). Antiemetics like ondansetron can prevent nausea and vomiting because nausea and vomiting can increase intracranial pressure and can risk bleeding in the surgical area after anesthesia. Adding glucocorticosteroid agents can decrease cerebral edema and reduce the risk of increased intracranial pressure (Esmaeeli, 2023). In fluid management in surgery, we must maintain euvolemia. For maintenance, we can use crystalloids. Crystalloids are due to because they are isotonic and maintain electrolyte balance. Continuous monitoring can maintain tissue perfusion, oxygen delivery, and metabolic system (Donatiello, 2022).

After the operation, we return the patient's position to a neutral position, which can cause instability of hemodynamics so strict monitoring must be used. After the hemodynamic stability, the patient was admitted to ICU. In ICU the patient can try for extubation. Extubation is one of the critical conditions because, without smooth extubation, intracranial pressure can increase the risk of coughing and can cause bleeding caused by increased intracranial pressure. Extubation criteria such as complete reversal of neuromuscular blocker, adequate spontaneous ventilation, and hemodynamic stability must be evaluated (Clevenger, 2020). After 3 days in the ICU, the patient can be extubated with hemodynamic stabilization, and all criteria for extubating are full field.

CONCLUSION

In conclusion, the case of the 39-year-old woman underscores the complexity of managing primary malignant brain tumors like glioblastoma. Preoperative assessments, meticulous anesthesia planning, and intraoperative monitoring are crucial for ensuring patient safety and optimal surgical outcomes. The multidisciplinary approach, including neurosurgery and anesthesia teams, enabled successful tumor resection despite the challenging anatomical location. Postoperative pain management and intensive care support further contributed to the patient's recovery, highlighting the importance of comprehensive perioperative care in neurosurgical procedures.

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