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PERIOPERATIVE MANAGEMENT OF CEREBELLOPONTINE ANGLE TUMOUR SURGERY USING A TIVA-BASED TECHNIQUE: A CASE SERIES

Dr. Aabroo Mawiya Hamid	Junior Resident, Department of Anaesthesiology Dr. D Y Patil School of Medicine, Nerul, Navi Mumbai
Dr Sunanda Panigrahi	Professor, Department of Anaesthesiology, Dr. D Y Patil School of Medicine, Nerul, Navi Mumbai
Dr Chaitali S Patil*	Assistant Professor, Department of Anaesthesiology, Dr. D Y Patil School of Medicine, Nerul, Navi Mumbai *Corresponding Author
Dr Shriya Reddy Thoutireddy	Junior Resident, Department of Anaesthesiology Dr. D Y Patil School of Medicine, Nerul, Navi Mumbai

ABSTRACT Cerebellopontine angle (CPA) tumours account for approximately 5–10% of all intracranial tumours, with vestibular schwannomas comprising 75–85% of CPA lesions [1,2,3] Surgical excision of these tumours is challenging because of their close relationship to the brainstem, cranial nerves, and major vascular structures. Anaesthetic management aims to provide optimal surgical conditions while maintaining haemodynamic stability, adequate cerebral perfusion, and facilitating reliable intraoperative neurophysiological monitoring (IONM). Total intravenous anaesthesia (TIVA), commonly using propofol and short-acting opioids, has emerged as a preferred technique in neuroanaesthesia due to its favourable effects on cerebral physiology and minimal interference with monitoring modalities such as brainstem auditory evoked potentials and facial nerve electromyography.TIVA offers better preservation of evoked potentials, smoother emergence, and facilitates early postoperative neurological assessment. Additionally, it is associated with a lower incidence of postoperative nausea and vomiting, which is particularly relevant in posterior fossa surgeries. This case series highlights our experience with TIVA-based anaesthetic management in patients undergoing CPA tumour excision.

KEYWORDS : Total Intravenous Anaesthesia; Cerebellopontine Angle Tumour; Neuroanaesthesia; Intraoperative Neuromonitoring

INTRODUCTION

The cerebellopontine angle (CPA) is a complex anatomical region within the posterior fossa containing critical neurovascular structures, including cranial nerves V–XI, the brainstem, and major cerebellar vessels[4]. Lesions arising in this region account for approximately 5–10% of intracranial tumours, with vestibular schwannomas being the most common pathology, followed by meningiomas and epidermoid cysts[5].

Surgical excision of CPA tumours is associated with several perioperative challenges, including limited surgical access, the need for specialized positioning, potential haemodynamic disturbances during brainstem manipulation, and the risk of cranial nerve injury. Preservation of facial nerve function and corticospinal tract integrity has become increasingly important with the widespread use of intraoperative neurophysiological monitoring techniques such as motor evoked potentials (MEPs), facial nerve electromyography (EMG), and brainstem auditory evoked potentials (BAEPs)[6]

Anaesthetic management plays a pivotal role in facilitating these monitoring modalities while ensuring adequate depth of anaesthesia, haemodynamic stability, and optimal operating conditions. Total intravenous anaesthesia (TIVA) has gained increasing acceptance in neuroanaesthesia because of its favourable cerebral physiological effects and compatibility with neurophysiological monitoring. We present a series of three patients undergoing CPA tumour excision managed with a TIVA-based anaesthetic strategy and discuss its perioperative advantages and clinical outcomes.

Case Report 1

A 52-year-old male, weighing 70 kg, with no known comorbidities or previous surgical history, was evaluated for cerebellopontine angle (CPA) tumour excision. The patient had a history of tobacco chewing for the past 30 years and no known drug allergies.

Presenting Complaints

The patient presented with headache, giddiness, and vertigo-like symptoms for 8–9 months, along with progressive hearing loss in the right ear.

Diagnosis

Right-sided vestibular schwannoma (acoustic neuroma) involving the cerebellopontine angle, posted for tumour excision via a retrosigmoid approach.

Preoperative Examination

- Heart Rate (HR): 90 beats/min, regular rhythm
- Blood Pressure (BP): 132/90 mmHg
- Peripheral Oxygen Saturation (SpO_2): 99% on room air

Respiratory System (RS): Bilateral equal air entry, clear on auscultation.

Cardiovascular System (CVS): Normal first and second heart sounds (S1 and S2), with no added sounds.

Airway Assessment

- Mouth opening: >3 finger breadths
- Modified Mallampati Classification (MPC): Grade II
- No anticipated difficulty in airway management.

Figure 1. Patient Positioned for CPA Tumour Surgery.

Case Report 2

A 33-year-old female (P3L3, full-term normal deliveries) weighing 58 kg, with no known comorbidities, was diagnosed with a right cerebellopontine angle epidermoid cyst and posted for retrosigmoid excision of the cyst. She had a past surgical history of tubal ligation performed 7 years earlier under total intravenous anaesthesia (TIVA), which was uneventful.

Presenting Complaints

The patient presented with a right frontotemporal headache radiating to the back of the neck for one year, with worsening severity over the preceding 2–3 days. Associated symptoms included photophobia and

phonophobia. A provisional diagnosis of trigeminal neuralgia was considered.

Preoperative Examination
- HR: 92 beats/min, regular
- BP: 110/80 mmHg
- SpO_2: 99% on room air
- RS: Bilateral equal air entry, clear on auscultation
- CVS: S1 and S2 normal

Airway Assessment
- Mouth opening >3 finger breadths
- Modified Mallampati Classification (MPC): Grade II

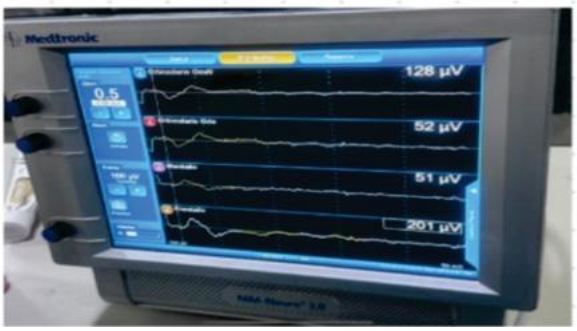

Figure 2 Motor Evoked Potential Monitoring Setup.

Case Report 3
A 46 year-old male, weighing 65 kg, with no known comorbidities or history of substance abuse, was diagnosed with a right vestibular schwannoma and posted for endoscopic excision of a cerebellopontine angle (CPA) tumour.

Presenting Complaints
The patient presented with impaired balance for 4–5 months and decreased hearing in the right ear. Prophylactic levetiracetam 500 mg twice daily was started two days preoperatively.

Past Surgical History
Open reduction and internal fixation (ORIF) of a right humeral shaft fracture and root canal treatment under general anaesthesia, both uneventful.

Preoperative Examination
- HR: 86 beats/min, regular
- BP: 130/80 mmHg
- SpO_2: 99% on room air
- RS: Bilateral equal air entry, clear on auscultation
- CVS: S1 and S2 normal

Airway Assessment
- Mouth opening >3 finger breadths
- Modified Mallampati Classification (MPC): Grade II

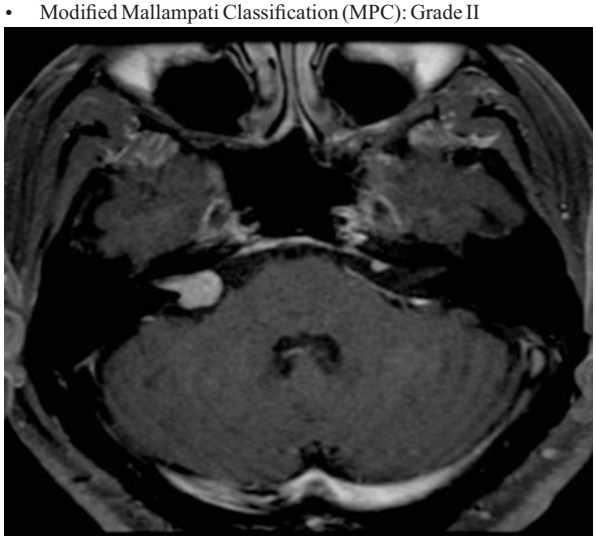

Figure 3 MRI Showing Vestibular Schwannoma.

Anaesthetic Management
After obtaining informed high-risk consent, confirming adequate nil per oral (NPO) status, and ensuring availability of reserved blood products, all three patients were scheduled for cerebellopontine angle (CPA) tumour excision. Baseline vital parameters were recorded, and standard American Society of Anesthesiologists (ASA) monitors were attached, including electrocardiography, non-invasive/invasive blood pressure monitoring, pulse oximetry, capnography, and Bispectral Index (BIS) monitoring. Baseline awake BIS values were documented prior to induction (normal range 95–100).

Anaesthesia was induced using intravenous midazolam, fentanyl (1–2 µg/kg), propofol (2 mg/kg), and atracurium (0.5–0.7 mg/kg) to facilitate tracheal intubation. Patients were intubated with appropriately sized cuffed polyvinyl chloride (PVC) endotracheal tubes, and mechanical ventilation was instituted using volume-controlled ventilation (VCV).

Maintenance of anaesthesia was achieved using a TIVA-based technique comprising propofol infusion (100–300 µg/kg/min) and dexmedetomidine infusion. Dexmedetomidine was administered with a loading dose of 1 µg/kg over 10 minutes followed by a maintenance infusion of 0.2–0.7 µg/kg/h, titrated according to haemodynamic response and anaesthetic requirements. Low-dose sevoflurane (MAC 0.5–0.7) was used as an adjunct to propofol–dexmedetomidine TIVA to reduce intravenous anaesthetic requirements while maintaining reliable intraoperative neurophysiological monitoring, as this concentration is unlikely to significantly suppress motor evoked potentials (MEPs)and also maintain the target BIS range of 40–60

Intraoperative neurophysiological monitoring included Motor Evoked Potentials (MEPs) using transcranial electrical stimulation to assess corticospinal tract integrity. Facial nerve EMG were monitored to evaluate preservation of cranial nerve VII function, while limb MEPs were used to assess motor pathway integrity throughout the procedure. BIS values were maintained between 40 and 60, ensuring adequate depth of anaesthesia and minimizing the risk of intraoperative awareness.

The duration of tumour excision ranged from 2 to 4 hours. Haemodynamic parameters remained stable throughout surgery, and no significant intraoperative neurological deterioration was observed. At the completion of tumour excision, preservation of facial nerve and limb MEP responses was confirmed in all patients.

All patients were extubated in the operating room after meeting standard extubation criteria and were subsequently transferred to the Intensive Care Unit (ICU) for postoperative monitoring. Supplemental oxygen and adequate multimodal analgesia were provided in the postoperative period. All three surgeries were uneventful, with minimal blood loss and satisfactory neurological outcomes.

Anaesthetic Considerations
- Requirement for stable haemodynamics and optimal cerebral perfusion.
- Facilitation of reliable intraoperative neurophysiological monitoring.
- Early emergence for prompt postoperative neurological assessment.
- Reduced incidence of postoperative nausea and vomiting.
- Secure airway management due to limited airway access following lateral or park-bench positioning.
- Preservation of cranial nerve and corticospinal tract function during tumour excision.

DISCUSSION
Cerebellopontine angle (CPA) tumour surgery presents significant anaesthetic challenges because of the close proximity of these lesions to the brainstem, cranial nerves, and major vascular structures. The primary goals of anaesthetic management include maintaining haemodynamic stability, ensuring optimal surgical conditions, preserving neurophysiological monitoring signals, and facilitating early postoperative neurological assessment.

In the present case series, a TIVA-based anaesthetic technique using propofol and dexmedetomidine, supplemented with low-dose sevoflurane, was employed in all three patients undergoing CPA tumour excision. This approach provided adequate depth of anaesthesia while maintaining stable haemodynamic parameters

throughout surgery. No episodes of intraoperative awareness, significant haemodynamic instability, or major anaesthetic complications were encountered.

A major advantage of TIVA in CPA surgery is its compatibility with intraoperative neurophysiological monitoring. Preservation of motor evoked potentials (MEPs) and facial nerve monitoring(EMG) is essential during tumour excision to minimize the risk of postoperative neurological deficits. The anaesthetic technique used in our patients allowed reliable monitoring throughout the procedure, with preservation of facial nerve and limb MEP responses at the completion of surgery.

Propofol-based anaesthesia also offers favourable cerebral haemodynamic effects by reducing cerebral metabolic rate and cerebral blood flow, thereby facilitating brain relaxation and improving surgical exposure[7.8]. Furthermore, the use of dexmedetomidine provided additional analgesic and anaesthetic-sparing effects while contributing to haemodynamic stability[9]

All patients were extubated successfully in the operating room and underwent early postoperative neurological evaluation. Blood loss was minimal, postoperative recovery was uneventful, and no new neurological deficits were observed. Our experience suggests that a TIVA-based anaesthetic strategy is a safe and effective approach for CPA tumour surgery, providing optimal operating conditions, reliable neuromonitoring, and smooth postoperative recovery.

Limitations

This case series is limited by the small sample size and the absence of a comparison group receiving volatile-based anaesthesia. Therefore, definitive conclusions regarding superiority of TIVA over other anaesthetic techniques cannot be drawn. Larger prospective studies are required to further evaluate clinical outcomes and neuromonitoring quality in CPA tumour surgery.

CONCLUSION

In this case series, TIVA-based anaesthetic management appeared to be a safe and effective technique for cerebellopontine angle (CPA) tumour surgery. It provides favourable intracranial pressure control and optimal brain relaxation while maintaining haemodynamic stability during critical phases of tumour excision. Furthermore, TIVA facilitates reliable intraoperative neurophysiological monitoring, allowing preservation of cranial nerve and motor pathway function. The technique enables smooth and rapid emergence, permitting early postoperative neurological assessment and is associated with a lower incidence of postoperative nausea and vomiting. In our case series, TIVA-based anaesthesia provided satisfactory surgical conditions, stable intraoperative parameters, successful neuromonitoring, and favourable postoperative outcomes, supporting its role as a valuable anaesthetic strategy in CPA tumour surgery.

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