Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical Anaesthesia

Journal homepage: www.ijca.in

Case Report

Anaesthetic management of a large parapharyngeal mass using electromyography monitoring

Geetha Ramalakshmi[1], Balasubramaniam Gayathri[1]*, Pranati Yerramilli[1], Karthik Kanthan[1]

[1]Dept. of Anaesthesiology, SRM Medical College Hospital, and Research Centre, Kattangulathur, Tamil Nadu, India

Abstract

Managing parapharyngeal space tumours presents significant anaesthetic challenges, particularly with airway access and the risk of neurovascular injury. A large pleomorphic adenoma extending into the parapharyngeal space was successfully excised via a transcervical mandibulectomy approach. Due to the anticipated difficulty in airway management, awake fiberoptic intubation was performed to ensure patient safety. Anaesthesia was maintained without neuromuscular relaxants using target-controlled infusions of propofol and fentanyl, allowing continuous neuromonitoring. Intraoperative nerve preservation was facilitated by electromyography (EMG) monitoring using an EMG endotracheal tube, which aided in the identification and protection of critical neural structures. Postoperative examination revealed normal vocal cord mobility with no signs of edema or nerve injury. The recovery period was uneventful, and the patient was discharged after 10 days. Follow-up at two months confirmed the absence of delayed nerve palsies, demonstrating a successful anaesthetic and surgical outcome.

Keywords: Electromyography, Pleomorphic adenoma, Airway management, Intraoperative nerve monitoring.

Received: 08-12-2024; **Accepted:** 25-03-2025; **Available Online**: 15-07-2025

1. Introduction

Pleomorphic adenoma presenting as a parapharyngeal mass is rare and often poses potential challenges for anesthesiologists and surgeons due to airway management issues and the risk of nerve injuries. Pleomorphic adenoma is the most common benign salivary gland tumor, with an annual incidence of approximately 2 to 3.5 cases per 100,000 population.[1] It usually affects the parotid gland[2] and, in most cases, occurs in women between the third and sixth decades of life.[3] When pleomorphic adenomas extend into the parapharyngeal space, they complicate airway management and require meticulous dissection to avoid injury to critical structures.[4]

Here, we present the case of a 42-year-old female with a large pleomorphic adenoma. Given the anticipated difficult airway and potential complications such as nerve palsies, an EMG endotracheal tube was utilized for intraoperative nerve monitoring to help prevent surgical and anaesthetic complications. The patient was successfully managed, and the entire duration of the hospital stay remained uneventful.

2. Case Presentation

A 42-year-old female presented with a six-month history of swelling in the soft palate, accompanied by progressively worsening dysphagia—initially to solids, later including liquids. On examination, a firm swelling measuring approximately 4 × 3 cm was observed on the left side of the soft palate, extending medially toward the midline and displacing the uvula. Fine-Needle Aspiration Cytology (FNAC) confirmed the diagnosis of a pleomorphic adenoma located within the parapharyngeal space.

Airway assessment revealed a Mallampati class IV (MPC IV) with restricted neck mobility, suggesting a potentially difficult intubation (**Figure 1**). The patient's vital

*Corresponding author: Balasubramaniam Gayathri
Email: gayathrii.r@gmail.com

https://doi.org/10.18231/j.ijca.2025.085

signs and laboratory investigations were within normal limits, and she had no known comorbidities.

Figure 1: Showing restricted neck mobility and mouth opening MPC 4

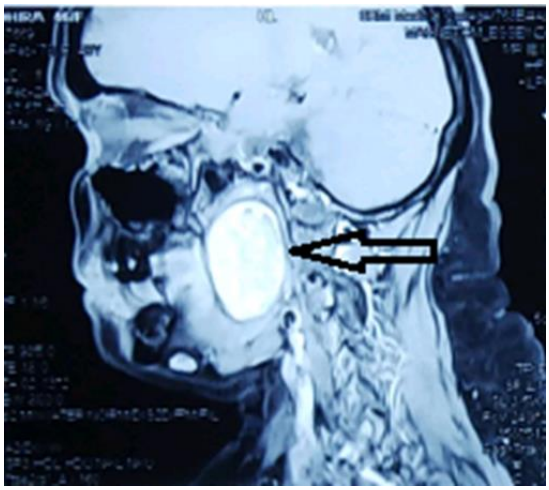

Figure 2: Magnetic resonance imaging showing large parapharyngeal mass

Magnetic Resonance Imaging (MRI) of the neck demonstrated a well-defined, heterogeneously hyperintense solid-cystic lesion in the left parapharyngeal space on T2-weighted imaging, with areas of peripheral diffusion suggestive of tumour infiltration (**Figure 2**). In view of the tumour's location and size, surgical excision was planned through a transcervical approach with mandibulectomy. Due to the predicted difficulty in securing the airway, the patient was assigned ASA Physical Status III, and awake fiberoptic intubation was chosen as the safest method for airway management.

In the preoperative area, topical anaesthesia was achieved using nebulization with 4% lignocaine (2 mL). Standard monitors including electrocardiogram (ECG), non-invasive blood pressure, respiratory rate, oxygen saturation (SpO_2), and end-tidal CO_2 ($EtCO_2$) were applied. Awake fiberoptic intubation was performed using the 'spray-as-you-go' technique with 10% lignocaine. A 7.0 mm cuffed flexometallic electromyography (EMG) endotracheal tube, lubricated with water-based jelly, was advanced successfully into the trachea under fiberoptic guidance. The correct position was confirmed by $EtCO_2$ waveform.

Anaesthesia was induced with intravenous propofol (2 mg/kg), followed by a single dose of vecuronium (6 mg) to facilitate initial surgical access. After confirming proper endotracheal tube placement, neuromuscular blockade was avoided to permit intraoperative nerve monitoring. Total intravenous anaesthesia was maintained using target-controlled infusion (TCI) of propofol and fentanyl based on the Schnider model, with plasma concentrations maintained at 3 µg/kg for propofol and 2 µg/kg for fentanyl.

Invasive monitoring was established via left radial artery cannulation for continuous blood pressure monitoring, and central venous access was secured through the right subclavian vein. Intraoperative EMG monitoring was employed to preserve critical cranial nerves, including the hypoglossal, facial, and vagus nerves, during tumour dissection.

At the conclusion of surgery, the EMG tube was replaced with a Portex endotracheal tube using a tube exchanger. TCI was discontinued, and the patient was transferred to the Post-Anaesthesia Care Unit (PACU) for elective mechanical ventilation and monitored sedation to mitigate the risk of airway compromise due to potential laryngeal edema. She was extubated successfully on postoperative day one without complications.

3. Discussion

Electromyography (EMG) endotracheal (ET) tubes are specifically designed for intraoperative neuromonitoring of the recurrent laryngeal nerve (RLN) and other cranial nerves at risk during head and neck surgeries (**Figure 3**). These tubes contain surface electrodes positioned near the vocal cords that detect nerve activity in real-time. The signals are displayed as waveforms and accompanied by audible alerts, offering continuous feedback throughout the procedure. A decrease in signal amplitude or complete loss of signal may indicate nerve irritation, traction, or injury, prompting immediate corrective action by the surgical team (**Figure 4**).

Intraoperative nerve monitoring has been shown to significantly reduce RLN injury rates to 2.43% (range: 1.55–3.5%) compared to 5.18% (range: 2.53–8.7%) in procedures performed without monitoring.[5] Despite these benefits, the incidence of RLN injury may still be underreported. Permanent vocal cord paralysis has been observed in 0.5% to 2.4% of cases, while transient paresis occurs in approximately 2.6% to 5.9%.[6] Clinical symptoms can vary widely and may include hoarseness, loss of vocal range, dysphagia, and aspiration.

However, EMG tubes have certain limitations. Their effectiveness may be compromised by the use of neuromuscular blocking agents, and they pose fire risks when used alongside flammable agents or thermal surgical devices. Additionally, they are not suitable for use in infants and are restricted to intraoperative application.[7] Reported

complications include difficult extubation, tube herniation, ventilatory failure, and inaccurate signal interpretation[7]. Despite these challenges, EMG monitoring proved invaluable in this case, facilitating safe dissection and contributing to the preservation of nerve function.

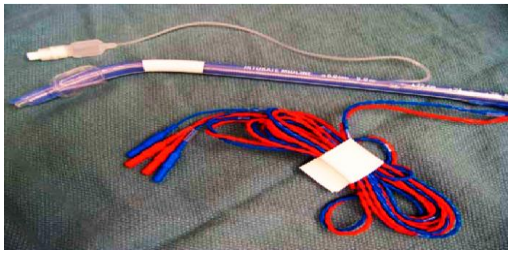

Figure 3: Electromyography endotracheal tube and its electrodes

Figure 4: Showing electromyography monitor. In case of critical nerve dissection, it shows an increase in amplitude which alerts the surgeons to avoid nerve injury

Nattawut Niljianskul et al. reported that the use of electromyography (EMG) endotracheal tubes during anterior cervical discectomy and fusion surgeries significantly improved the detection of postoperative recurrent laryngeal nerve (RLN) injuries, demonstrating high sensitivity and specificity.[8] This study underscores the effectiveness of EMG tubes in the early identification and potential prevention of nerve injury during high-risk procedures.

Target-controlled infusion (TCI) systems are designed to deliver anaesthetic and sedative agents by maintaining a specified target plasma concentration, thereby optimizing drug delivery and therapeutic effect. The pharmacokinetic-pharmacodynamic (PK-PD) model developed by Schneider and colleagues incorporates covariates such as age, height, weight, and lean body mass into a three-compartment model, improving the accuracy and individualization of dosing regimens.[9] TCI systems are particularly effective in achieving rapid drug equilibrium and maintaining steady-state plasma concentrations.[10]

In critical care and perioperative settings, TCI technology has been shown to reduce pharmacokinetic variability, improve hemodynamic stability, and minimize the need for manual dose adjustments. In this case, the use of TCI allowed for smooth anaesthetic management, with stable intraoperative hemodynamics and a predictable recovery profile.

The patient was regularly monitored postoperatively and remained clinically stable, with no symptoms or signs suggestive of nerve injury.

4. Conclusion

Effective management of parapharyngeal space tumours requires careful preoperative evaluation, meticulous airway planning, and strategies to minimize nerve injury. The use of target-controlled infusion allows stable anaesthesia while preserving neuromuscular function for intraoperative monitoring. Incorporating EMG endotracheal tubes enhances nerve protection during surgery and contributes to improved patient safety and surgical outcomes.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. O'Connell R, McCaskie AW, Sayers RD. Bailey & Love's Short Practice of Surgery. 28th ed. Boca Raton, FL: CRC Press; 2023. p. 831–51.
2. Abdelhamid AS, Elzayat S, Essa AA, Elsherief H, Amer M. Pleomorphic adenoma of the cheek: a case presentation. *Egypt J Otolaryngol*. 2022;38:165.
3. Lwaniya DS, Meena R, Kumar D, Tolat A, Arya SV. A review of the current literature on pleomorphic adenoma. *Cureus*. 2023;15(7):e42311.
4. Dalal S, Thammishetty S, Chandak A. Airway management in case of recurrence of pleomorphic adenoma of right submandibular gland and soft palate. *Indian J Sci Technol*. 2019;12(46):1–5.
5. Pardal-Refoyo JL, Ochoa-Sangrador C. Bilateral recurrent laryngeal nerve injury in total thyroidectomy with or without intraoperative neuromonitoring: systematic review and meta-analysis. *Acta Otorrinolaringol Esp*. 2016;67(2):66–74.
6. Terris DJ, Anderson SK, Watts TL, Chin E. Laryngeal nerve monitoring and minimally invasive thyroid surgery: complementary technologies. *Arch Otolaryngol Head Neck Surg*. 2007;133(12):1254–7.
7. Kim HS, Park KS, Kang MH, Park CD. Damage to the cuff of EMG tube at endotracheal intubation by using a lightwand – a case report. *Korean J Anesthesiol.* 2010;59(Suppl):S17–S20.
8. Niljianskul N, Phoominaonin IS, Jaiimsin A. Intraoperative monitoring of the recurrent laryngeal nerve with electromyography endotracheal tube in anterior cervical discectomy and fusion. *World Neurosurg X*. 2022;17:100141.
9. Forkin KT, Nemergut EC. Miller's Anesthesia. 8th ed. Anesthesiology. 2016;124:977–8.
10. Al-Rifai Z, D Mulvey. Principles of total intravenous anaesthesia: practical aspects of using total intravenous anaesthesia. *BJA Educ.* 2016;16(8):276–80.

Cite this article: Ramalakshmi G, Gayathri B, Yerramilli P, Kanthan K. Anaesthetic management of a large parapharyngeal mass using electromyography monitoring. *Indian J Clin Anaesth*. 2025;12(3):545–547.