









# Anesthetic management of a patient with a difficult airway undergoing embolization of a lingual arteriovenous malformation: a case report

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## ABSTRACT

Arteriovenous malformations of the tongue are rare vascular anomalies that may pose significant anesthetic challenges due to the risk of bleeding and airway obstruction. We report the anesthetic management of a 17-year-old patient with a large lingual arteriovenous malformation undergoing endovascular embolization. Despite relatively favorable airway parameters, the lesion suggested a potential difficult airway. Rapid sequence induction was performed, and tracheal intubation was successfully achieved using videolaryngoscopy to minimize trauma and bleeding. Anesthesia was maintained with sevoflurane, remifentanyl, and cisatracurium. The procedure and postoperative period were uneventful. This case highlights the importance of careful preoperative assessment and appropriate airway management strategies.

## KEYWORDS

Arteriovenous malformation; difficult airway; anesthesia; case report

## INTRODUCTION

Arteriovenous malformations (AVMs) are congenital vascular anomalies characterized by abnormal connections between arteries and veins, without the presence of a normal capillary bed. When located in the head and neck region, especially in the tongue, these lesions present significant challenges for anesthetic management due to the risk of airway obstruction and massive hemorrhage<sup>(1,2)</sup>.

From a pathophysiological perspective, tongue AVMs can lead to progressive enlargement of the organ, resulting in difficulties with chewing, swallowing, and speech. Furthermore, the abnormal vascularization

makes these lesions prone to bleeding, which may occur spontaneously or be triggered by minimal trauma. The growth of the AVM can compromise the airway, resulting in a difficult airway scenario for the anesthesiologist<sup>(3,4)</sup>.

Endovascular embolization has proven to be an effective therapeutic option for treating AVMs, allowing for selective occlusion of the lesion's feeding vessels. However, the procedure requires general anesthesia, adding complexity to the management of these patients. Conventional orotracheal intubation may be challenging or even impossible due to the increased size and fragility of the tongue<sup>(2,5)</sup>.

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The anesthetic management of patients with tongue AVMs and a difficult airway requires a careful and individualized approach. Detailed preanesthetic evaluation, meticulous planning of the airway management strategy, and the availability of alternative equipment and techniques are essential to ensure patient safety<sup>(6)</sup>.

This report describes the anesthetic management of a patient with a large lingual arteriovenous malformation undergoing endovascular embolization. The case highlights the importance of thorough preoperative assessment, anticipation of difficult airway scenarios, and the use of videolaryngoscopy to minimize airway trauma and bleeding risk.

The objective is to report a case of anesthetic management in a patient with a difficult airway undergoing embolization of a lingual arteriovenous malformation.

## CASE REPORT

This descriptive case report was conducted in accordance with the ethical principles for research involving human subjects established by Resolution No. 466/2012 of the Brazilian National Health Council. The study was approved by the Research Ethics Committee of Hospital Santa Marcelina (approval number 7.162.358; CAAE 82482624.6.0000.0066).

A 17-year-old female patient presented with a four-year history of an arteriovenous malformation located in the right hemilingual region measuring 5.9 × 2.6 × 4.7 cm. The patient reported progressive tongue enlargement and occasional discomfort but no previous airway obstruction episodes. She had a history of cocaine use and was under a socio-educational legal measure.

During the preanesthetic evaluation, the patient was classified as American Society of Anesthesiologists (ASA) physical status III due to the presence of significant vascular malformation associated with potential bleeding risk and a history of substance abuse with possible cardiovascular implications.

Airway assessment revealed a Mallampati score of I in the neutral position, mouth opening of 3 cm, and a mentosternal distance greater than 12.5 cm, with preserved cervical mobility. However, when the tongue was fully protruded, the Mallampati score changed to II, reflecting the significant bulk of the arteriovenous malformation and its potential to compromise airway space during manipulation. Despite otherwise favorable airway parameters, the presence of the large vascular lesion raised concerns regarding possible bleeding and airway obstruction during airway management.

Baseline vital signs were stable, with a blood pressure of 132/91 mmHg, heart rate of 97 beats per minute,

and peripheral oxygen saturation (SpO<sub>2</sub>) of 96% while breathing room air.

Upon arrival in the operating room, standard monitoring was applied, including electrocardiography (ECG), noninvasive blood pressure (NIBP), pulse oximetry (SpO<sub>2</sub>), capnography (EtCO<sub>2</sub>), and bispectral index (BIS) monitoring.

Peripheral venous access was obtained with an 18-gauge catheter.

Rapid sequence induction was performed with propofol 2 mg/kg, fentanyl 3 µg/kg, and succinylcholine 1.5 mg/kg.

Tracheal intubation was successfully achieved using a videolaryngoscope, minimizing contact with the vascular lesion and reducing the risk of bleeding.

After intubation, anesthesia was maintained with sevoflurane (0.8–1.0 MAC), remifentanyl infusion (0.1–0.2 µg/kg/min), and cisatracurium 0.1 mg/kg for neuromuscular blockade.

Mechanical ventilation was performed in volume-controlled mode, maintaining normocapnia.

The endovascular embolization procedure lasted approximately two hours and occurred without hemodynamic instability or airway complications.

At the end of the procedure, neuromuscular blockade was reversed, and the patient was extubated uneventfully after meeting standard extubation criteria. She was transferred to the postanesthesia care unit (PACU) for monitoring and subsequently discharged to the ward. The postoperative period was uneventful, and the patient was discharged from the hospital the following day.

## DISCUSSION

The case presented involves a young patient with multiple anesthetic challenges, including an arteriovenous malformation (AVM) in the right hemilingual region, cocaine use, and ASA physical status III — indicating the presence of severe systemic disease and suggesting an increased anesthetic risk<sup>(8)</sup>. We will discuss the main aspects of anesthetic care: preanesthetic evaluation and anesthetic management.

The preanesthetic evaluation plays a crucial role in anticipating a difficult airway (DA). This preliminary step allows the anesthesiologist to identify potential challenges in patient intubation and ventilation, thereby enabling the implementation of appropriate management strategies. Specific DA algorithms can be followed, and the availability of specialized equipment such as videolaryngoscopes and bronchofiberscopes should be ensured at the time of anesthetic induction. This proactive approach not only enhances procedural safety but also optimizes time and resources during the anesthetic intervention<sup>(1)</sup>.

In the preanesthetic period (Figure 1), the presence of a sizable AVM in the right hemilingual region is recognized as a significant risk factor, as it can lead to complications such as bleeding, local edema, and airway compromise<sup>(5)</sup>. Although the Mallampati score appeared favorable for intubation, it remained essential to assess the patient's overall condition.

Still within the preanesthetic context, the patient's history of cocaine use had to be considered, as it increases cardiovascular risks and may interfere with anesthetic response. Cocaine can cause coronary vasoconstriction, hypertension, arrhythmias, and myocardial ischemia<sup>(3,4)</sup>. Therefore, it is crucial for the anesthesia team to be prepared for potential cardiovascular complications related to cocaine use, such as arrhythmias or myocardial ischemia.

Regarding anesthetic management, the choice of rapid sequence induction was appropriate, considering the aspiration risk and the need for rapid airway control. The presence of the AVM in the tongue could complicate airway management. Thus, the use of a videolaryngoscope was a wise and prudent decision, as it provides better visualization and a higher first-attempt intubation success rate<sup>(4)</sup>. The videolaryngoscope is a resource that increases the chances of successful intubation in anticipated difficult airway (DA) cases. In this reported case, the patient had suitable mouth opening and using a standard laryngoscope would have pushed against the right-sided AVM, increasing the risk of bleeding. In contrast, the videolaryngoscope enters through the center of the mouth, avoiding such trauma. However, it does require an experienced practitioner to operate effectively.

The maintenance of anesthesia with sevoflurane, remifentanyl, and cisatracurium was appropriate for

the case described. Sevoflurane offers hemodynamic stability, remifentanyl allows precise control of analgesia<sup>(4)</sup>, and cisatracurium is a safe choice for muscle relaxation, especially in patients with hepatic or renal dysfunction.

Additional considerations for management and hemodynamic monitoring: maintaining hemodynamic stability is crucial, avoiding hypertensive peaks that could increase the risk of AVM bleeding. Beyond standard monitoring, it would be advisable to consider invasive blood pressure monitoring, possibly central venous pressure monitoring, and, if available, a smart hemodynamic monitoring system to help predict potential intraoperative complications<sup>(7)</sup>.

In cases involving vascular malformations of the oral cavity, strict hemodynamic control is essential to minimize the risk of bleeding from the lesion. Continuous monitoring and careful titration of anesthetic agents help prevent hypertensive responses during airway manipulation and surgical stimulation. The use of short-acting agents such as remifentanyl allows rapid adjustment of analgesic depth and contributes to stable intraoperative conditions.

Beyond the perioperative period, planning for postoperative analgesia was important, particularly given the patient's history of drug use.

The anesthetic management described appears to have been successful, with induction, maintenance, and extubation occurring without complications. However, it is important to emphasize that patients with this profile require continuous vigilance and preparation for potential complications throughout the entire perioperative period.



**Figure 1.** Preoperative clinical photograph demonstrating significant enlargement of the tongue caused by a right-sided lingual arteriovenous malformation, highlighting the potential risk for difficult airway management.

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