

Unilateral hypoglossal nerve palsy following intubation

Jaclyn K. Schneider MD, Britta L. Bureau MD,
Varun Sampat MD, Raquel Farias-Moeller MD

Department of Neurology, Medical College of
Wisconsin, Milwaukee, WI, USA

Introduction

The hypoglossal nerve, cranial nerve XII, functions to control movements of the tongue and infrahyoid muscles.¹ Nerve damage is a known potential consequence following intubation under general anesthesia.² The most commonly injured nerves after orotracheal intubation are the recurrent laryngeal, lingual, and hypoglossal nerves.³ Pressure from the blade of the laryngoscope can cause shearing to the hypoglossal nerve fibers, resulting in damage.² This damage can lead to dysarthria, dysphagia, and tongue deviation.²⁻⁶

This case report details a patient who underwent general anesthesia and endotracheal intubation for an exploratory laparotomy who subsequently experienced unilateral hypoglossal nerve palsy.

Case Presentation

A 22-year-old woman weighing 94.3 kg, ASA III, received general anesthesia for an exploratory laparotomy to biopsy a pelvic mass. She had a past medical history significant for obesity class III, anemia, thrombocytopenia, and ovarian cancer. Prior to the operation, her neurologic exam was completely normal. Her Mallampati score was II with a normal mouth opening. The patient was preoxygenated with an anesthesia mask at 100% FiO₂. Subsequently, general anesthesia was induced with propofol. Succinylcholine was used for muscle relaxation to facilitate intubation. After 4 minutes of preoxygenation with a mask, she underwent laryngoscopy and orotracheal intubation. Intubation was performed with a McGrath size 3 laryngoscope blade. The patient was intubated with a 7.5 mm cuffed endotracheal tube, secured at 22 cm at the lips.

Anesthesia was maintained with sevoflurane. The surgery was completed without complications, and the patient was successfully extubated. The total length of anesthesia was 151 minutes.

On evaluation in the post-anesthesia care unit, there was no evidence of damage to the dentition, tongue, mouth, and oropharynx. The following day, the patient complained of right-sided tongue numbness and difficulty swallowing. On evaluation, her tongue was noticeably swollen with a prominent right-sided deviation (Figure 1). The patient reported odd sensations while swallowing but was able to swallow a liquid meal. She was informed that the tongue deviation was likely cranial nerve XII neuropraxia due to

intubation, and that her symptoms would likely resolve spontaneously in 1-2 weeks. Eight days later, after the patient had been admitted to our children's hospital oncology unit, pediatric neurology was consulted for further evaluation. She reported minor improvements in tongue swelling and deviation, but continued to struggle with swallowing. An MRI of the brain with and without contrast was obtained to ensure a cranial nerve XII nucleus lesion was not contributing to her presentation. MRI brain with and without contrast demonstrated T2/FLAIR hyperintensity in the right side of the tongue with mild tongue swelling at the posterior aspect of the right half of the tongue, suggesting early denervation changes in the right side of the tongue (Figure 2).

The patient was seen by a speech pathologist who provided recommendations for eating. The patient was discharged home with instructions to continue monitoring for improvement in symptoms.

Discussion

Cranial nerve injuries following airway manipulation under general anesthesia are rare, however, there exist several reports of hypoglossal nerve palsy.² The extent of impairment from these types of injuries depends on the extent and duration of the initial insult. These deficits may be transient, involving complete recovery of motor function, or permanent, with partial or no recovery of function.⁵ In an analysis of hypoglossal nerve injury conducted by Shah et al., 43.3% of

Figure 1. Tongue deviation to the right on postoperative day 9.

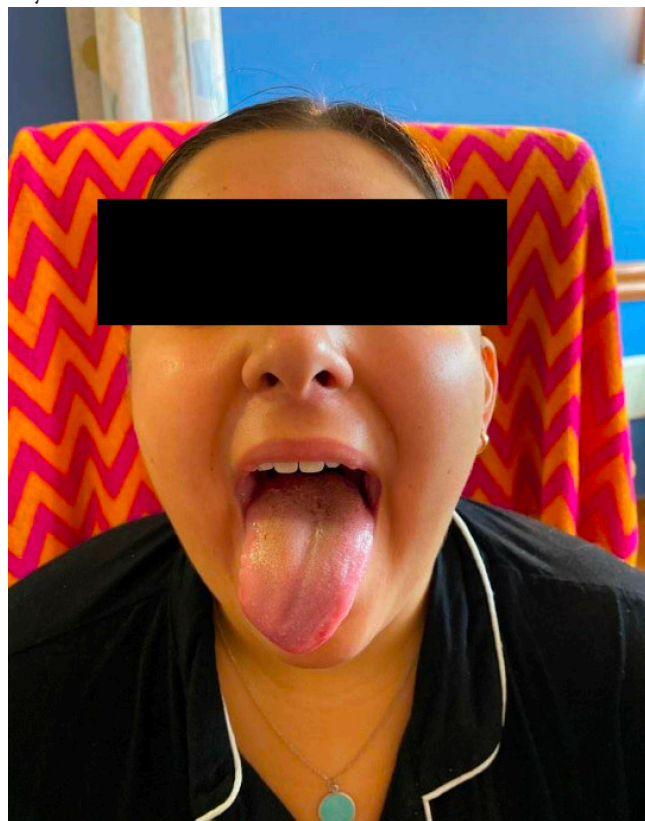
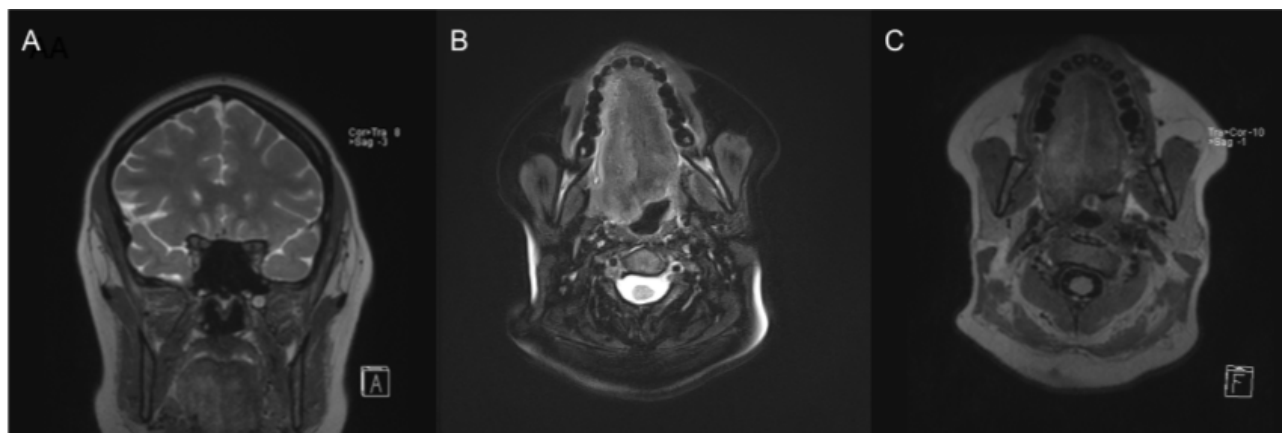


Figure 2. A) MRI Brain Coronal T2 post-contrast. Mild contrast enhancement of patchy T2/FLAIR hyperintensities on right side of tongue. B) MRI Brain Axial T2. Mild swelling in the posterior aspect of the right side of the tongue, causing partial effacement of the right oropharyngeal and hypopharyngeal passage. C) MRI Brain Axial T2 post-contrast. Mild contrast enhancement of patchy T2/FLAIR hyperintensities on right side of tongue.



patients had complete resolution of symptoms 6 weeks after surgery, 40% had complete resolution of symptoms 6 months after surgery, and an additional 8.3% had persistent symptoms at varying follow-up intervals.⁷ Potential mechanisms of hypoglossal nerve injury during intubation include head positioning and excessive inflation of the cuff in the larynx or extubation with an inflated cuff.^{4,8,9,10} Other mechanisms of injury specifically involving the anatomy of the hypoglossal nerve have been proposed: nerve compression at the hyoid bone, nerve stretching over the transverse process of the first cervical vertebrae, shearing of the distal nerve fibers from pressure exerted by the laryngoscope blade, and nerve compression via calcification of the stylohyoid ligament.⁷ The pathway of the hypoglossal nerve is extensive, exiting the medullary segment of the brainstem, passing through the hypoglossal canal and major vessels of the neck, running near the greater cornu of the hyoid bone, and then terminating along the mylohyoid muscle of the tongue. These fibers are relatively superficial and can be compressed by a laryngoscope blade during intubation.⁶ MRI and CT can play important diagnostic and localizing roles in cases of hypoglossal nerve palsy. Depolarization of the resting membrane potential as a result of denervation has been shown to inhibit sodium-potassium pump function, thus increasing intramuscular capillary volume and extracellular fluid.¹¹ Through this mechanism, denervation edema may be seen on the affected side of the tongue in hypoglossal nerve palsy. On MRI in the acute and subacute settings, this appears as an increase in T2 signal intensity and increased gadolinium enhancement in the affected side. In cases of chronic denervation with associated reduction in ipsilateral muscle bulk and increased fatty infiltration, ipsilateral volume loss and hypoattenuation will be present on CT and T1 shortening on MRI. Imaging may be able to help isolate the site of injury to the carotid or posterior sublingual space if there is atrophy of infrahyoid muscles present.¹ Our patient had a relatively uncomplicated

intubation, without note of excessive cuff inflation in anesthesia records. MRI in the subacute setting demonstrated denervation edema, as identified by an increased T2 signal intensity in the posterior aspect of the tongue. There were no imaging findings suggestive of injury and atrophy of the infrahyoid muscles. Four weeks following our patient's initial insult, she had shown very minor improvements in symptoms. Considering this trajectory, we anticipate she will have a relatively slow recovery, if full recovery is possible.

Ethics approval: This study was performed in accordance with appropriate ethical standards.

Consent to participate: Patient consent obtained

Consent for publication: Patient consent obtained

Availability of data and material: Data obtained from chart review, which is protected for participant privacy given the nature of a case report involving a single patient.

Declarations:

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