

# Delayed Hypoglossal Nerve Injury After Traumatic Skull Base Fracture: A Case Report and Literature Review

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July 16, 2024

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Keywords: hypoglossal, delayed, trauma, palsy Data availability: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Conflict of Interest: The authors have no conflicts of interest to disclose.

## Key Clinical Message

Our case demonstrates that delayed hypoglossal palsy secondary to trauma can be resolved with conservative, non-operative management with a team-based approach.

## Introduction

The authors discuss a case of a delayed hypoglossal nerve (HGN) injury arising three months after occipital condyle fracture (OCF) caused by a motor vehicle accident. Delayed HNP is a rare complication following OCF. Management of OCF often fails to prevent or relieve HNP over time with chronic persistence of tongue deviation and atrophy, dysphagia, and dysarthria. To date, there are only 11 cases of delayed isolated HNP after skull base trauma in the literature. Of the 11 reported cases, only three report a complete resolution of hypoglossal nerve injury [1,2,3]. While the exact mechanism for the delayed onset palsy remains unclear, it has been suggested that callus formation during normal healing can impinge on the nerve as it exits the canal [2,4,5]. Herein, the authors present the case of a patient who developed HNP three months following the initial presentation at our institution. This case illustrates considerations when dealing with OCFs, as

well as management of delayed HNP, a documented but rare complication of skull base fractures adjacent to the hypoglossal canal.

### Case History and Examination

A 25-year-old female presented to the emergency department (ED) after a car accident, sustaining an Anderson and Montesano type III occipital condyle fracture. Other injuries included fractures of the left thumb and radius, the latter treated surgically. Initially neurologically intact, she chose a non-surgical approach with a cervical-thoracic orthosis (CTO) brace. Three months later, she developed dysphagia and tongue weakness and atrophy without deviation. Imaging revealed a healing fracture affecting the right hypoglossal canal and nerve edema. Treatment with methylprednisolone was initiated, alongside multidisciplinary care involving neurosurgery, otolaryngology, speech language pathology (SLP), and physical medicine and rehabilitation (PMR). Subsequent evaluations indicated modest improvement in tongue paresis, and she eventually experienced complete symptom resolution over the next three months.

### Methods

A 25-year-old female with no significant past medical history presented to the ED in 2022 following a car accident in which she was a restrained passenger. Imaging was performed in light of facial abrasions, neck pain, and tingling in both hands. Computerized tomography (CT) revealed an occipital condyle fracture, classified as Anderson and Montesano type III. (Figures 1-3). Other injuries included fractures of the left thumb and radius, which were treated surgically. She was otherwise intact neurologically. An magnetic resonance image (MRI) of the cervical spine did not show any ligamentous disruption or cord compromise, and discussion of various treatment options including surgical fixation versus halo immobilization versus cervicothoracic orthosis (CTO), the patient elected for CTO brace for eight to ten weeks. At two month follow up, she noted gradual improvement in her presenting symptoms, and after confirmation on X-ray that the fracture had healed, her brace was discontinued.

At the three month mark, she presented to the ED with complete resolution of her initial symptoms but noted new dysphagia and tongue weakness over the past week. She had severe atrophy on the right side of her tongue and had great difficulty moving it to the left. She had no other cranial nerve dysfunctions. Speech was fluent without dysarthria. She had dysphagia without signs of aspiration. Imaging demonstrated a healing fracture causing obscuration of the internal opening of the right hypoglossal canal as well as perineural edema of the intracanalicular portion of the nerve (Figures 1-4). The options of observation, steroids, or surgical decompression of the right hypoglossal canal were discussed with the patient, who preferred conservative management. She underwent a trial of methylprednisolone and was advised to make appointments with ENT and SLP as well. Laryngoscopy performed by ENT confirmed no other palate deformities or swallowing malfunctions indicative of additional lower cranial nerve injuries. SLP evaluation noted modest, gradual improvement in tongue paresis. Via telehealth encounter at the one year mark, the patient stated that her HNP had completely resolved three months after its delayed onset.

### Conclusion and Results

This case describes a unique situation in which the delayed HNP successfully resolved following conservative management. Moreover, it underscores the need for clinicians to be vigilant for delayed nerve palsies in skull base fractures. We present a case of delayed hypoglossal nerve palsy caused by the healing process of an occipital condyle fracture. This case illustrates the delayed fashion in which the palsy can present, and represents, to our knowledge, the only reported case of a true delayed HNP from OCF that completely resolved without surgical intervention. Through a multidisciplinary approach including neurosurgery, ENT, and SLP, a complete recovery is possible from this rare secondary injury.

### Discussion

Isolated hypoglossal nerve palsy is a rare complication of traumatic occipital condyle fracture, and can evade diagnosis by presenting in a delayed fashion. Atraumatic cases are even rarer, and occasionally involve cervical vertebral junction tuberculosis [2,6,7]. Moreover, HNPs that result as a consequence of

OCFs are notoriously difficult to treat. In fact, from 1989 to 2024, only 11 cases of isolated HNP have been reported with only three achieving complete resolution (see Table 1). Traumatic cases of OCFs more commonly result in Collet-Sicard syndrome (unilateral palsy of the lower cranial nerves) and it has been suggested that isolated hypoglossal nerve palsy are less common because the anterior condylar canal is located near the jugular foramen, within 7 mm on the intracranial side and 3 mm on the extracranial side [1]. Vadivelu et al were the first to demonstrate a causal relationship between decompression of the canal and resolution of neuropraxia and HNP. This supports the idea that callus formation over the nerve during the healing process is responsible for the delayed presentation of the HNP.

Management of OCF is often conservative, and relies on the use of a rigid cervical collar for 6 weeks or longer [8]. However, to our knowledge, there is no other reported evidence of complete resolution of HNP through conservative management alone. In one notable exception, Ucler et al. report the use of methylprednisolone to treat HNP 3 days following OCF. However, the rapid onset and resolution of the HNP suggests that the palsy was a result of edema and not callus formation or permanent damage to the hypoglossal nerve. Our patient achieved complete resolution of HNP through conservative treatment, but also with the use of an interdisciplinary team of ENT and SLP.

#### Author Contributions:

Author 1: conceptualization, formal analysis, writing – original draft

Author 2: conceptualization, data curation, formal analysis, writing – review and editing

Author 3: writing – review and editing

Author 4: writing – review and editing

Author 5: supervision, validation

Author Consent Statement: I, Malik Sameer Obeidallah, affirm that written informed consent has been collected from the patient by the authors and proof of consent is available upon request.

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