

Unilateral Hypoglossal Nerve Injury in a Collegiate Wrestler: A Case Report

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Objective: To introduce the case of a collegiate wrestler who suffered a traumatic unilateral hypoglossal nerve injury. This case presents the opportunity to discuss the diagnosis and treatment of a 20-year-old man with an injury to his right hypoglossal nerve.

Background: Injuries to the hypoglossal nerve (cranial nerve XII) are rare. Most reported cases are the result of malignancy, with traumatic causes less common. In this case, a collegiate wrestler struck his head on the wrestling mat during practice. No loss of consciousness occurred. The wrestler initially demonstrated signs and symptoms of a mild concussion, with dizziness and a headache. These concussion symptoms cleared quickly, but the athlete complained of difficulty swallowing (dysphagia) and demonstrated slurred speech (dysarthria). Also, his tongue deviated toward the right. No other neurologic deficits were observed.

Differential Diagnosis: Occipital-cervical junction fracture, syringomyelia, malignancy, iatrogenic causes, cranial nerve injury.

Treatment: After initial injury recognition, the athletic trainer placed the patient in a cervical collar and transported him to the emergency department. The patient received prednisone, and the emergency medicine physician ordered cervical spine plain radiographs, brain computed tomography, and brain and internal auditory canal magnetic resonance imaging. The physician consulted a neurologist, who managed the patient conservatively, with rest and no contact activity. The neurologist allowed the patient to participate in wrestling 7 months after injury.

Uniqueness: To our knowledge, no other reports of unilateral hypoglossal nerve injury from relatively low-energy trauma (including athletics) exist.

Conclusions: Hypoglossal nerve injury should be considered in individuals with head injury who experience dysphagia and dysarthria. Athletes with head injuries require cranial nerve assessments.

Key Words: twelfth cranial nerve, tongue paralysis, dysarthria, dysphagia

Injuries to the hypoglossal nerve (cranial nerve [CN] XII) are rare. The majority of reported cases result from malignancy; traumatic causes are less common.¹ Penetrating trauma, iatrogenic causes, and occipital-cervical junction fractures from motor vehicle crashes account for most traumatic cases.¹⁻⁵ To our knowledge, unilateral hypoglossal nerve injury from relatively low-energy trauma (including athletics) has not been reported. The purposes of this report are to illustrate the unique case of a collegiate wrestler who sustained a unilateral hypoglossal nerve injury and to review the relevant literature. This report serves to remind clinicians of the role of the certified athletic trainer (AT) in recognizing the clinical signs and symptoms associated with CN XII injury, so as to facilitate timely medical referral and treatment of this uncommon condition.

CASE REPORT

A 20-year-old male collegiate wrestler struck the superior portion of the frontal bone of his skull on the wrestling mat (axial load) while he was being "taken down" with his arms restrained by an opponent during practice. No loss of consciousness occurred. The team AT evaluated the wrestler immediately in the wrestling room. The patient initially demonstrated signs and symptoms of a mild concussion, with dizziness and a headache. These concussion symptoms cleared quickly, but the patient complained of difficulty swallowing (dysphagia) and demonstrated slurred speech (dysarthria). Also, his tongue deviated

toward the right during tongue protrusion (Figure 1). The AT observed no other neurologic deficits. After conducting an assessment of the CNs, the AT recognized a possible acute injury to CN XII, applied a cervical collar, and transported the patient to the emergency department.

The patient's initial visit to the emergency department was uneventful. The physician diagnosed the patient with a mild concussion without conducting radiologic imaging and discharged the patient with concussion precautions. The wrestler's signs and symptoms of tongue motor loss persisted without improvement into the next day, so the AT instructed the wrestler to continue neck immobilization with the cervical collar and to return to the emergency department early that morning.

The second visit to the emergency department led to a more comprehensive examination. During this visit, the patient's main complaint was difficulty moving his tongue to the left. He denied headache or any other neurologic deficits. His past medical history was negative for recent viral illness or other constitutional symptoms. The physician's examination revealed an impaired hypoglossal nerve with deviated right tongue movement and right-sided tongue fasciculations. Normal speech and no sensory abnormalities were noted. The remaining CNs were tested, with no other deficits found. The only other significant finding was tenderness on the right side of the patient's neck at the occipital, C1, and C2 levels during palpation. The patient received prednisone, 20 mg, 3 tablets orally every day for 5 days, followed by 2 tablets orally every day

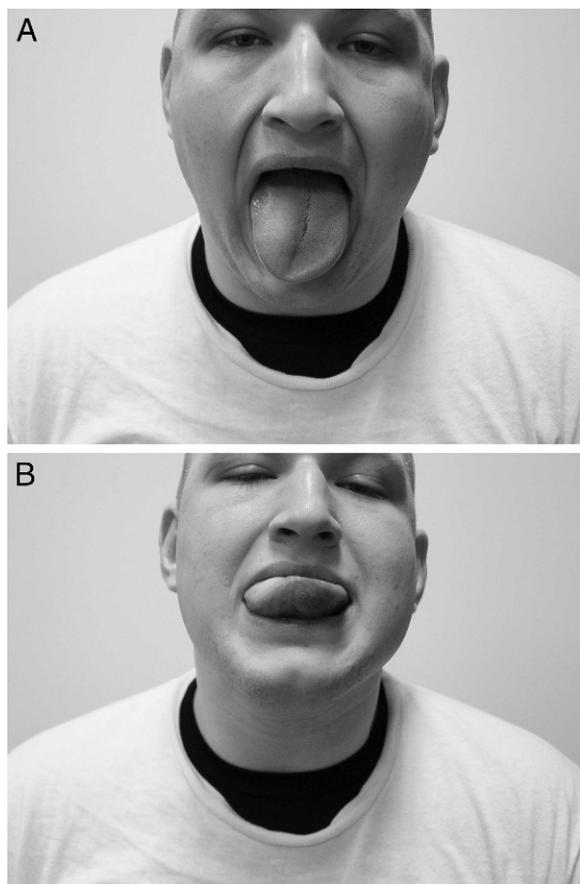


Figure 1. Tongue deviation 3 days after right hypoglossal nerve injury. **A,** Dorsal surface. **B,** Ventral surface.

for 3 days, and then 2 tablets orally each day for 2 days. The physician ordered the following radiologic studies: cervical spine plain radiographs (anterior-posterior, lateral, oblique, odontoid), brain computed tomography without contrast, brain magnetic resonance imaging (MRI) with and without contrast, and internal auditory canals MRI with and without contrast. All imaging was interpreted as within normal limits. The patient was referred to the outpatient neurology department, allowed to remove his cervical collar, and ordered not to return to sports until examined and released by the neurologist.

The patient was seen 2 days later by the neurologist. At this point, the patient estimated 50% overall improvement in the motor function of his tongue. The neurologist examined the patient and ordered MRI (without contrast) of the cervical spine, which was completed 17 days after the initial injury. The MRI revealed a midcervical to upper thoracic cord syringohydromyelia at approximately C4 to T2. A repeat cervical spine MRI with contrast was done 27 days after injury (Figure 2). That MRI revealed a stable syrinx and no evidence of enhancing cord masses or significant central canal stenosis. The neurologist considered the syrinx a possible congenital normal variant and suggested that hypoglossal nerve compression at the cranio-cervical junction during the injury caused the motor deficit to the right side of the tongue.

At 2 months postinjury, the patient estimated 75% improvement in the motor function of his tongue. He still complained of decreased strength on the right side of the

tongue. The patient's tongue was atrophied, but no tongue fasciculations were observed, and deviation of the tongue to the affected right side on protrusion was decreased (Figures 3 and 4). Repeat MRIs for comparison revealed no change from the previous imaging studies. At that time, the neurologist did not allow the patient to return to wrestling, because it was not possible to completely rule out whether the syrinx of the spinal cord contributed to the injury. The neurologist recommended continued conservative care and avoidance of contact activity. The patient was instructed to follow up at 6 months postinjury or sooner if his signs and symptoms worsened.

The patient followed up with the neurologist at 7 months postinjury. He reported no real change or improvement from his 2-month postinjury visit. Again, the patient stated that his tongue motor function was estimated at 75% of normal and reported that he had developed improved compensation techniques for speech and swallowing. At this point, the patient could speak normally without slurring his words, and he swallowed without difficulty. Yet his tongue was still atrophied and deviated slightly to the right. Final cervical spine comparison MRIs were conducted with no significant changes from previous imaging studies. The neurologist allowed the patient to participate in wrestling at that time.

DISCUSSION

Our case involves a wrestler who developed a hypoglossal nerve (CN XII) deficit that did not fully recover despite conservative medical treatment. We searched the databases EBSCO, MEDLINE, and PEDro and found nothing on the topic of unilateral hypoglossal nerve injury in an athlete. Traumatic, isolated unilateral CN XII palsy is rare and may go undetected at time of injury, both clinically and radiographically.⁶ Causes of hypoglossal nerve injury include occipital-cervical junction fracture, syringomyelia, malignancy, and iatrogenic sources.¹⁻⁵ Dysphagia and dysarthria are key signs for hypoglossal nerve trauma.^{7,8}

The hypoglossal nerve innervates the tongue and controls its functions: swallowing and speech. The nerve arises by several rootlets between the pyramids and the olives of the medulla. It leaves the cranium through the hypoglossal canal and runs inferiorly and anteriorly, passing medial to the angles of the mandible and between the mylohyoid and hypoglossus to reach the muscles of the tongue.⁹ As CN XII descends through the hypoglossal canal at the skull base, it crosses the anterior surface of the transverse process of C1.⁴ The hypoglossal nerve can become stretched across the transverse process of C1 during hyperextension at the cranio-cervical junction.⁷⁻⁹

Trauma to the base of the skull in the region of the occipital condyle typically occurs after significant decelerative head injuries, which are normally associated with motor vehicle crashes.^{9,10} In comparison, injury during athletic participation, such as wrestling, is a relatively low-energy mechanism. Computed tomography scanning of the cranio-cervical junction is essential to confirm or rule out the diagnosis of cranial base fractures.¹¹ Both cranial base trauma in the region of the occipital condyle and syringomyelia may result in hypoglossal palsy.¹¹ An element of one or both of these conditions may have contributed to the patient's hypoglossal injury. As previ-



Figure 2. Sagittal T2 magnetic resonance image showing a syrinx within the spinal cord (white arrow).

ously mentioned, the patient was diagnosed approximately 2 weeks after the initial injury, via MRI, with a midcervical to upper thoracic syringohydromyelia, which is also referred to as syringomyelia, hydromyelia, and, most commonly, syrinx.¹² Syringomyelia specifically refers to a fluid-filled cavity in the spinal cord extending lateral to or independent of the central canal.¹³ Hydromyelia refers to a dilated central canal of the cord.¹³ Most cavities involve both parenchyma and central canal, and the term *syringohydromyelia* indicates the combined occurrence of syringomyelia and hydromyelia.¹⁴ Many clinicians use syringomyelia and syrinx as general terms for any cord cyst.¹²

Causes of a syrinx include hydrocephalus, Chiari malformation, trauma, tethered spinal cord, and tumor; a large number have no clear cause.¹²⁻¹⁴ In this case, we do not know the cause of the patient's syrinx. The question of whether the patient possessed a preexisting syrinx or developed it because of his injury during wrestling practice

remains unanswered. Symptoms of a syrinx normally develop slowly over time but can come on suddenly after a fall or minor trauma.¹² These symptoms include headache,^{12,15} altered pain and temperature sensation,^{12,14,15} and paresthesia.¹²⁻¹⁵ The patient's neurologist indicated that little to no relationship existed between the clinical findings in this case and the discovery of the syrinx. The patient's repeated MRIs over time reflected no change in a stable syrinx, which may have been a congenital normal variant according to the neurologist. The presence of acute palpable tenderness at the patient's right occipital-cervical junction suggested that traumatic compression of the hypoglossal nerve may have been the more likely cause for the motor deficit to the right side of the tongue.

The prognosis for isolated unilateral CN XII palsies is good, with most resolving by 6 months.^{11,16} In this case and other documented cases, when palsy lasted longer than 6 months, near-normal clinical function was reported within 12 months.^{11,16} We consider our patient's 75% self-



Figure 3. Tongue deviation 2 months after right hypoglossal nerve injury.



Figure 4. Right-sided tongue atrophy 2 months after right hypoglossal nerve injury.

reported improvement as near-normal clinical function. More specifically, his ability to speak without slurring his words and to swallow without difficulty indicated near-normal tongue function. The neurologist felt that this level of function was acceptable and allowed the patient to participate in wrestling at 7 months postinjury. The wrestler has yet to recover normal function of his tongue and has continued atrophy and slight deviation to the right of the tongue. Unilateral traumatic hypoglossal nerve palsy has been shown to have a better prognosis than bilateral palsies, probably because a unilateral lesion is usually caused by a nerve root injury, whereas bilateral lesions suggest an intrinsic spinal cord lesion.¹¹ The patient did not receive electromyographic evaluation. According to Kuitwaard and Vandertop,⁴ specific treatment of unilateral lesions is not required, because they usually improve spontaneously.

The CNs can be tested promptly: sense of smell (I), pupil reactivity (II and III), eye tracking (III, IV, VI), facial expressions (VII), biting down (V), swallowing (IX, X), protrusion of the tongue (XII), and shoulder shrugs (XI).¹⁷ Alterations of the CN responses could indicate a more severe head injury and the need for immediate referral of the patient to a physician or transport to the hospital. Early cervical collar use after cranio-cervical junction trauma may help to prevent the development of CN XII palsy.¹¹ A cervical collar should be worn at least until cranio-cervical junction fractures are ruled out.¹¹ This case illustrates the value of ATs being knowledgeable about and proficient in performing CN examinations.

CONCLUSIONS

Unilateral hypoglossal nerve injury is extremely rare after athletic trauma. The cause in our patient may have been a traction injury to the hypoglossal nerve at the base of the skull concurrent with head injury. Hypoglossal nerve injury should be considered in individuals with head injury who complain of dysphagia and dysarthria.^{7,8} Most unilateral CN XII palsies usually resolve by 6 months^{11,16}; in this case, near-normal function of the tongue returned within 7 months. This patient serves as a reminder that CN assessments are required for even mild head injuries.

REFERENCES

1. Keane JR. Twelfth-nerve palsy: analysis of 100 cases. *Arch Neurol*. 1996;53(6):561–566.
2. Chugh S, Kamian K, Depreitere B, Schwartz ML. Occipital condyle fracture with associated hypoglossal nerve injury. *Can J Neurol Sci*. 2006;33(3):322–324.
3. Hong JT, Lee SW, Son BC, Sung JH, Kim IS, Park CK. Hypoglossal nerve palsy after posterior screw placement on the C-1 lateral mass: case report. *J Neurosurg Spine*. 2006;5(1):83–85.
4. Kuitwaard K, Vandertop WP. A patient with an odontoid fracture and atrophy of the tongue: a case report and systematic review of the literature. *Surg Neurol*. 2005;64(6):525–532.
5. Paley MD, Wood GA. Traumatic bilateral hypoglossal nerve palsy. *Br J Oral Maxillofac Surg*. 1995;33(4):239–241.
6. Aulino JM, Tutt LK, Kaye JJ, Smith PW, Morris JA Jr. Occipital condyle fractures: clinical presentation and imaging findings in 76 patients. *Emerg Radiol*. 2005;11(6):342–347.
7. Kacker A, Komisar A, Kakani RS, Reich E, Rothman L. Tongue paralysis following head trauma. *J Laryngol Otol*. 1995;109(8):770–771.
8. Kenrick MM, Bredfeldt RC, Sheridan CD, Monroe AD. Bilateral injury to the hypoglossal nerve. *Arch Phys Med Rehabil*. 1977;58(12):578–582.
9. Cirak B, Akpınar G, Palaoglu S. Traumatic occipital condyle fractures. *Neurosurg Rev*. 2000;23(3):161–164.
10. Demisch S, Lindner A, Beck R, Zierz S. The forgotten condyle: delayed hypoglossal nerve palsy caused by fracture of the occipital condyle. *Clin Neurol Neurosurg*. 1998;100(1):44–45.
11. Castling B, Hicks K. Traumatic isolated unilateral hypoglossal nerve palsy—case report and review of the literature. *Br J Oral Maxillofac Surg*. 1995;33(3):171–173.
12. Klekamp J. The pathophysiology of syringomyelia: historical overview and current concept. *Acta Neurochir (Wien)*. 2002;144(7):649–664.
13. Brodbelt AR, Stoodley MA. Syringomyelia and the arachnoid web. *Acta Neurochir (Wien)*. 2003;145(8):707–711.
14. Schurch B, Wichmann W, Rossier A. Post-traumatic syringomyelia (cystic myelopathy): a prospective study of 449 patients with spinal cord injury. *J Neurol Neurosurg Psychiatry*. 1996;60(1):61–67.
15. Rene Hudson B, Cook C, Goode A. Identifying myelopathy caused by thoracic syringomyelia: a case report. *J Man Manipulative Ther*. 2008;16(2):82–88.
16. Delamont RS, Boyle RS. Traumatic hypoglossal nerve palsy. *Clin Exp Neurol*. 1989;26:239–241.
17. Oliaro S, Anderson S, Hooker D. Management of cerebral concussion in sports: the athletic trainer's perspective. *J Athl Train*. 2001;36(3):257–262.

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