Hemiplegic Syndrome After Chopstick Penetration Injury in the Lateral Soft Palate of a Young Child

Syna Daudfar, OMS II; Codee Gorman, OMS II; John T. Pham, DO

From the Western University
of Health Sciences College of
Osteopathic Medicine of the
Pacific–Northwest in Lebanon,
Oregon.

Financial Disclosures:
None reported.

Support: None reported.

Address correspondence to
John T. Pham, DO, 200
Mullins Dr, Lebanon, OR
97355-3983.

Email: jtpham@westernu.edu

Submitted
October 30, 2017;
revision received
December 13, 2017;
accepted
December 28, 2017.

Soft palate penetrating injuries have been reported among children, particularly in children falling with objects in their mouth. The authors present a case of a healthy 14-month-old child who fell onto a blunt-ended chopstick, the subsequent cerebrovascular accident, and the role of the osteopathic tenets thereafter. The child had an acute infarction to the region of his right middle cerebral artery secondary to right internal carotid artery occlusion. Physicians should consider the neurologic sequelae of lateral soft palate injuries and damage to the surrounding anatomical structures. A thorough, whole-patient approach to physical examination is critical.

J Am Osteopath Assoc. 2018;118(8):555-559
doi:10.7556/jaoa.2018.124

Keywords: hemiplegic syndrome, pediatrics, soft palate penetrating injury

Accidental falls onto a foreign object resulting in penetrating injuries of the oral mucosa, nares, and orbit are uncommon. Among these injuries, transoral penetration is a rare clinical presentation, particularly in the pediatric population.¹ Neurologic sequelae from a blunt-ended object penetrated through the soft palate has not been reported in the literature since the 1960s, to our knowledge.^{2,3} Because of the good prognosis of intraoral injuries, management has not been well defined.^{2,3} We report the case of a child in whom hemiplegia developed after a lateral soft palate penetrating injury from a blunt-ended object. We discuss the role of the osteopathic tenets in his evaluation, diagnosis, and treatment, as well as assessment strategies for patients with penetrating injuries, based on our literature search.

Report of Case

A healthy 14-month-old child presented to the emergency department immediately after falling at home with a chopstick in his mouth (**Figure 1**). He had no symptoms except for mild bleeding from the roof of his mouth. No imaging was done at that time. The patient was discharged and, according to his medical record, precautionary instructions were provided. The patient continued to perform activities of daily living—he walked, ran, crawled up stairs, pointed to objects, and spoke words for “food,” “mom,” and “dad.” Approximately 40 hours after the incident, his parents noticed a left facial droop and decreased use of his left arm.

Twenty hours after noticing the facial droop, the family was urged by the child’s primary care physician to bring him back to the emergency department to undergo further evaluation, including imaging. Quick brain magnetic resonance (MR) imaging without contrast, brain MR angiography without contrast, and carotid MR angiography

Figure 1.

An illustration of penetrating trauma to the superior pharyngeal constrictor muscle, which caused injury to the internal carotid artery. Source: Randall DA, Kang DR. Current management of penetrating injuries of the soft palate. *Otolaryngol Head Neck Surg.* Vol 135. 2006/09/05 ed2006:356-360. Reprinted by Permission of SAGE Publications, Inc.

with and without contrast were performed. The MR imaging revealed an acute right middle cerebral artery infarct involving most of its territory (**Figure 2**). The MR angiography showed a long segment of occlusion in the right internal carotid artery (**Figure 3**). The occlusion extended from the carotid sinus to the ophthalmic artery, with partial reconstitution and filling through the circle of Willis but narrowing of the right anterior cerebral artery and middle cerebral artery. He was subsequently given the diagnosis of a cerebrovascular accident (CVA). Imaging findings suggested that the patient likely had hemiplegic syndrome from a carotid dissection due to the internal carotid artery's proximity to the lateral soft palate (superior pharyngeal constrictor muscle). He was given heparin for anticoagulation therapy, then switched to 300 mg/3 mL of enoxaparin injections every 12 hours for 3 months. He

Figure 2.

Magnetic resonance image of the brain of a 14-month-old child after a lateral soft palate penetrating injury in the (A) coronal view and (B) transverse view showed a right-sided middle cerebral artery infarct.

was discharged to a rehabilitation facility on hospital day 14.

The patient received inpatient physical therapy for 2.5 weeks, with the goal of improving his physical function to positively affect neurologic structure. At the beginning of therapy, the patient required total assistance for all mobility, including transitional activities, because of his inability to bear weight on the left leg. The patient had left facial weakness and slight weakness in his left bicep and hip flexors. He had no active movement and no increased muscle tone on his left side. He moved his right upper extremity and right lower extremity appropriately. Neurologic examination at the start of physical therapy revealed good visual fixation and tracking and appropriate stranger anxiety. At the end of his therapy, he sat, stood, and

Figure 3. Magnetic resonance angiography images of a 14-month-old child after a lateral soft palate penetrating injury from an (A) anterior-posterior view and (B) posterior-anterior view showed right side occlusion of the internal carotid artery from the carotid sinus to the ophthalmic artery.

kneeled with minimal assistance. He remained unable to walk, and no additional words were added to his vocabulary.

One week after the completion of inpatient physical therapy, neurologic examination revealed grossly intact cranial nerves II through XII, except for subtle left facial droop. He had significant left upper extremity hypotonicity, with minimal spontaneous movement and mild limited range of motion in the left lower extremity compared with the right lower extremity. The patient had no spasticity in his extremities and had appropriate responses to light touch on all extremities. Deep tendon reflexes were 2+ in the right upper and lower extremities and 1+ in the left upper and lower extremities. His left first toe was upgoing, and his right first toe was downgoing.

Approximately 2 months after discharge from the hospital, the patient had mild improvement with strength and mobility on his left side but required bracing of his left leg and a support to stand. The multi-disciplinary team's interests of the family, child, and his overall development played an important role in this improvement. The osteopathic tenet of viewing the body as a whole unit and the understanding that structure and function are interrelated were considered when the decision to brace the child's leg and provide a support to stand was made. The combination of anticoagulation therapy and structural bracing aided the child's body to self-regulate and self-heal. After the cessation of the enoxaparin injections, the medication prescription was switched to a daily 81 mg aspirin. His treatment continues to include physical therapy, which began as weekly sessions, but the frequency may be altered depending on the patient's progress.

Discussion

To our knowledge, this is the first case report of hemiplegic syndrome caused by blunt trauma from a chopstick that did not penetrate the skull or vertebral bodies. In 1996, Pitner³ hypothesized that an intimal tear could propagate thrombosis in the internal carotid artery, resulting in CVA. Imaging findings in the current case supported Pitner's hypothesis. Children at the developmental stage of the patient (ie, aged 14 months) have yet to complete skull elongation, which explains the injury's proximity to the carotid sinus.

We identified 24 chopstick-related injuries in the pediatric population since 1995. Of these 24 injuries, 14 were classified as transorbital, 4 were transoral, 2 were transnasal, 2 were transbuccal, and 2 were temporal bone penetrations.⁴ A series of reports revealed transoral injury and subsequent hemiparesis caused by a sharp-ended chopstick.^{5,6} To our knowledge, no cases of hemiparesis after a penetrating injury from a blunt-ended chopstick have been reported.

Management of penetrating injuries is often self-limiting, and current guidelines suggest nonsurgical

management.^{7,8} However, penetrating injuries with neurologic complications are difficult to assess and require interdisciplinary consultation.⁹ Research regarding the management of ischemic CVAs in the pediatric population has not been evidence-based and is extrapolated from treatment recommendations for adults. Randomized trials have shown benefit of intervention up to 6 hours after CVA onset.¹⁰⁻¹³ A 2017 randomized trial found that endovascular thrombectomy improved disability and functional outcomes in adults with ischemic CVA up to 24 hours after becoming symptomatic.¹⁴ Data on the efficacy of tissue plasminogen activator administration in children are not available; however, the National Institutes of Health funded a study¹⁵ that evaluated thrombolysis in pediatric CVA. The study¹⁵ recommended preliminary guidelines for treatment of ischemic CVA, but the recommendations were limited to expert consensus and collective experience.

Other recommendations describe the role of a diligent physical examination for adequate triage. For example, tenderness at the mandible angle suggests damage to the peritonsillar musculature and possible neurovascular compromise.⁵ Other studies^{16,17} have identified that a midline soft palate through-and-through penetration is typically less severe than a lateral penetration. These injuries are associated with a 60-hour lucid interval and, thus, hospitalization for at least 3 days is recommended.^{5,16,17} Our literature search identified interval Doppler images and, more recently, computed tomographic scans as being useful in the detection of significant thrombosis and prevention of neurologic sequelae.^{5,18-20}

These recommendations are rebutted by Randall and Kang,⁹ who made an important point regarding the costs associated with the recommended 3-day hospitalization and serial imaging. Their review highlights the lack of supporting evidence for a particular intervention in patients with a penetrating injury to the soft palate. Additionally, they reference Suskind et al,¹⁷ who found a low number of patients with neurologic complications after penetrating injuries involving the soft

palate. Therefore, imposing large health care costs onto patients and the health care system may be unwarranted given the low incidence of chopstick penetration injuries.

The current case highlights the additional costs that result from neurologic sequelae of penetrating injuries involving the soft palate. We propose a method of triaging patients that will minimize the risk of serious sequelae after oral penetration injuries but will also keep health care costs reasonable. This method includes a thorough physical examination, including assessment of mandibular angle tenderness. If mandibular angle tenderness is present in the setting of lateral soft palate injury, we recommend consideration for hospitalization up to 60 hours with routine neurologic assessments per hospital protocol. This recommendation is warranted because of the association of mandibular angle tenderness with neurovascular compromise. However, with any oral penetration injury, robust patient and family education on neurologic changes should be provided. To prevent serious sequelae, the importance of prompt return to the physician or emergency department after any changes in symptoms should be emphasized.

The current patient benefited from a whole-person assessment and therapy. However, although his hemiparesis was improving, the effects of the brain injury may remain throughout his life and require comprehensive, whole-person evaluation and treatment of his mind, body, and spirit as he gradually discovers his inability to participate in daily activities for his age group. The progression of the patient's symptoms illustrates how a localized trauma can cause a global impact to the total body unit.

Conclusion

Lateral soft palate penetration injuries in children may result in lifelong deficits. Currently, there is a lack of consensus regarding the best management strategy for soft palate penetration injuries because of the limited number of cases reported. We recommend prompt physical examination and risk stratification and stress

that patients with lateral soft palate impalement and lateral mandible tenderness are at high risk and should be monitored closely. We also encourage physicians to consider the osteopathic tenets in the evaluation and treatment of these patients.

Acknowledgments

We express our sincerest gratitude to Paul Evans, DO; Paul Aversano, DO; William Merbs, PhD, ABD; Edward Goering, DO; and David Clark, DO, for their guidance, edits, and recommendations.

References

- Chauhan N, Guillemaud J, El-Hakim H. Two patterns of impalement injury to the oral cavity: report of four cases and review of literature. *Int J Pediatr Otorhinolaryngol*. 2006;70(8):1479-1483. doi:10.1016/j.ijporl.2006.02.002
- Bickerstaff ER. Aetiology of acute hemiplegia in childhood. *Br Med J*. 1964;2(5401):82-87.
- Pitner SE. Carotid thrombosis due to intraoral trauma: an unusual complication of a common childhood accident. *N Engl J Med*. 1966;274(14):764-767. doi:10.1056/NEJM196604072741403
- Samuthrat T, Ye K, Tong Y. Transoral intracranial injury via middle skull base by a blunt chopstick in a child. *World Neurosurg*. 2017;103:952.e11-952.e17. doi:10.1016/j.wneu.2017.04.084
- Hengerer AS, DeGroot TR, Rivers RJ Jr, Pettee DS. Internal carotid artery thrombosis following soft palate injuries: a case report and review of 16 cases. *Laryngoscope*. 1984;94(12 pt 1):1571-1575.
- Melio FR, Jones JL, Djang WT. Internal carotid artery thrombosis in a child secondary to intraoral trauma. *J Emerg Med*. 1996;14(4):429-433.
- Raska GM, Cordova SW, Lema R, Goldwasser MS. Management of penetrating trauma to the soft palate: a case report. *J Oral Maxillofac Surg*. 2007;65(7):1279-1285. doi:10.1016/j.joms.2006.10.056
- von Domarus H, Poeschel W. Impalement injuries of the palate. *Plast Reconstr Surg*. 1983;72(5):656-658.
- Randall DA, Kang DR. Current management of penetrating injuries of the soft palate. *Otolaryngol Head Neck Surg*. 2006;135(3):356-360. doi:10.1016/j.otohns.2005.12.003
- Saver JL, Goyal M, Bonafe A, et al. Stent-retriever thrombectomy after intravenous t-PA vs. t-PA alone in stroke. *N Engl J Med*. 2015;372(24):2285-2295. doi:10.1056/NEJMoa1415061
- Berkhemer OA, Fransen PSS, Beumer D, et al. A randomized trial of intraarterial treatment for acute ischemic stroke. *N Engl J Med*. 2015;372(1):11-20. doi:10.1056/NEJMoa1411587
- Campbell BCV, Mitchell PJ, Kleinig TJ, et al. Endovascular therapy for ischemic stroke with perfusion-imaging selection. *N Engl J Med*. 2015;372(11):1009-1018. doi:10.1056/NEJMoa1414792
- Goyal M, Demchuk AM, Menon BK, et al. Randomized assessment of rapid endovascular treatment of ischemic stroke. *N Engl J Med*. 2015;372(11):1019-1030. doi:10.1056/NEJMoa1414905
- Nogueira RG, Jadhav AP, Haussen DC, et al. Thrombectomy 6 to 24 hours after stroke with a mismatch between deficit and infarct. *N Engl J Med*. 2018;378(1):11-21. doi:10.1056/NEJMoa1706442
- Rivkin MJ, deVeber G, Ichord RN, et al. Thrombolysis in Pediatric Stroke (TIPS) study. *Stroke*. 2015;46(3):880-885. doi:10.1161/STROKEAHA.114.008210
- Shanon E, Cohn D, Streifler M, Rapoport Y. Penetrating injuries of the parapharyngeal space. *Arch Otolaryngol*. 1972;96(3):256-259. doi:10.1001/archotol.1972.00770090378011
- Suskind DL, Tavill MA, Keller JL, Austin MB. Management of the carotid artery following penetrating injuries of the soft palate. *Int J Pediatr Otorhinolaryngol*. 1997;39(1):41-49. doi:10.1016/S0165-5876(96)01460-7
- Balasubramanian C, Kaliaperumal C, Jadun CK, Dias PS. Transorbital intracranial penetrating injury-an anatomical classification. *Surg Neurol*. 2009;71(2):238-240. doi:10.1016/j.surneu.2007.07.050
- Taniura S, Tatebayashi K, Akatsuka K, et al. Transoral penetration of a half-split chopstick between the basion and the dens. *AJNR Am J Neuroradiol*. 2004;25(5):871-872.
- Wang HF, Li WC, Xu N, Fu SL. Transoral penetrating craniocerebral injury by a bamboo chopstick in a child. *J Clin Neurosci*. 2013;20(5):746-748. doi:10.1016/j.jocn.2012.03.053

© 2018 American Osteopathic Association