Emergency management in a regional setting of a paediatric patient with penetrating injury of the hard palate from a metal drinking straw

Jacob Arahill-Whitham, Hitesh Tailor, Dean Ruske

Case

History and examination

A 21-month-old female presented to a rural Aotearoa New Zealand emergency department with a retractable metal straw impaled through her hard palate following a fall from a push bike. On arrival, the patient was intermittently distressed but consolable. She was clinically stable with a full range of eye movements, no focal neurology and no respiratory distress.

Investigations

The decision was made to proceed with imaging before transfer. An X-ray revealed a radiopaque foreign body that appeared to be penetrating the nasal sinuses, with the tip possibly sitting at the frontal skull base. A computed tomography (CT) of the head was recommended to assess for possible intracranial injury. The CT showed the tip buried in the body of the sphenoid bone. The foreign body was in close contact with the apex of the right orbit, and the report detailed possible right medial rectus muscle impingement.

Management

The case was discussed with the otolaryngology team and accepted for transfer to the nearest tertiary centre. The neurosurgery team were also consulted and available on standby.

The patient was urgently transferred via helicopter to the nearest tertiary centre, 4 hours and 33 minutes following the initial call to emergency services. Intravenous access was obtained before transfer, and the patient was accompanied by a parent and the flight retrieval team. A consultant intensivist with airway expertise and emergency intubation equipment accompanied the patient. She remained stable without the need for airway support.

On arrival, she was taken directly to the operating theatre, 92 minutes following departure from the regional centre. After sedation, the foreign body was removed in one attempt without resistance. The patient was intubated following rapid sequence induction. Tracheostomy equipment was available but not required. The oral cavity was inspected and an anterior hard palate perforation with bony avulsion into the nasal cavity was noted. Nasal endoscopy revealed intact inferior and middle turbinates. The bony fragment that had avulsed from the nasal floor was manipulated back into place with near total closure of the defect before packing the nasal cavity with Nasopore Forte.

The patient remained well on the ward post-operatively and resumed a normal diet. There were no noted concerns with eye movements. She was discharged 1 day post-operatively with a week of oral antibiotics, and no further issues were reported during follow-up.

Discussion

While paediatric traumatic injuries of the palate are a common cause of paediatric presentation to health services, complications with long-term sequelae are relatively rare.[1] Potential complications reported in the literature from oropharyngeal trauma include airway compromise, vascular injury with catastrophic neurological sequelae, bleeding, retropharyngeal abscess, facial cellulitis, velopharyngeal insufficiency and pneumomediastinum.[2–5] Penetrating injuries of the hard palate are comparably rare and present additional risk to the orbit and brain.[6] The discussed case was made more challenging due to care being provided in a regional setting with the need for efficient inter-hospital communication and transfer.

The incidence of oropharyngeal trauma in

Figure 1: Lateral plain film (top left) and CT slices in sagittal (top right), axial (bottom left) and coronal (bottom right) demonstrating metallic foreign body penetrating hard palate and traversing nasal passage with tip in the sphenoid bone.

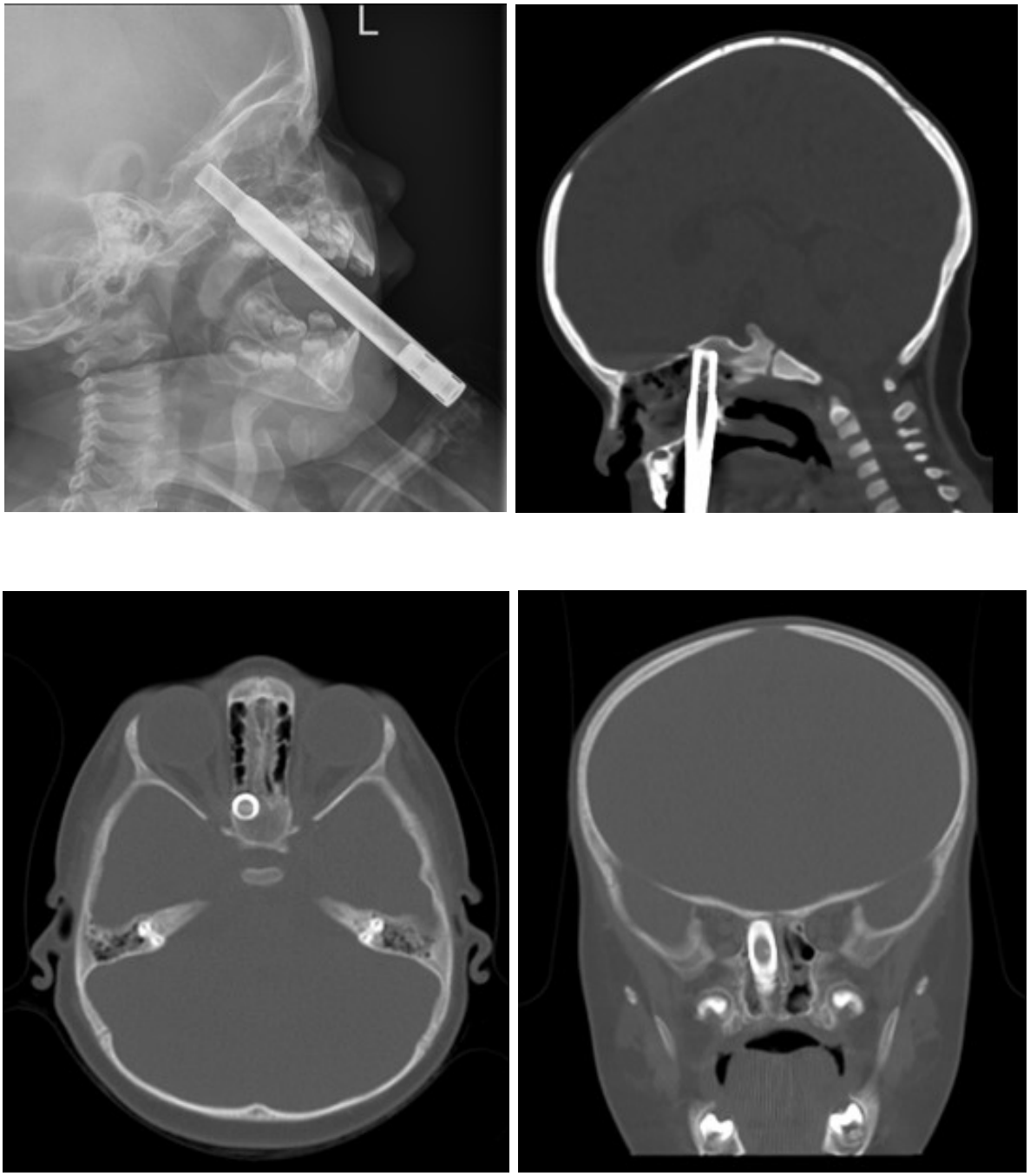
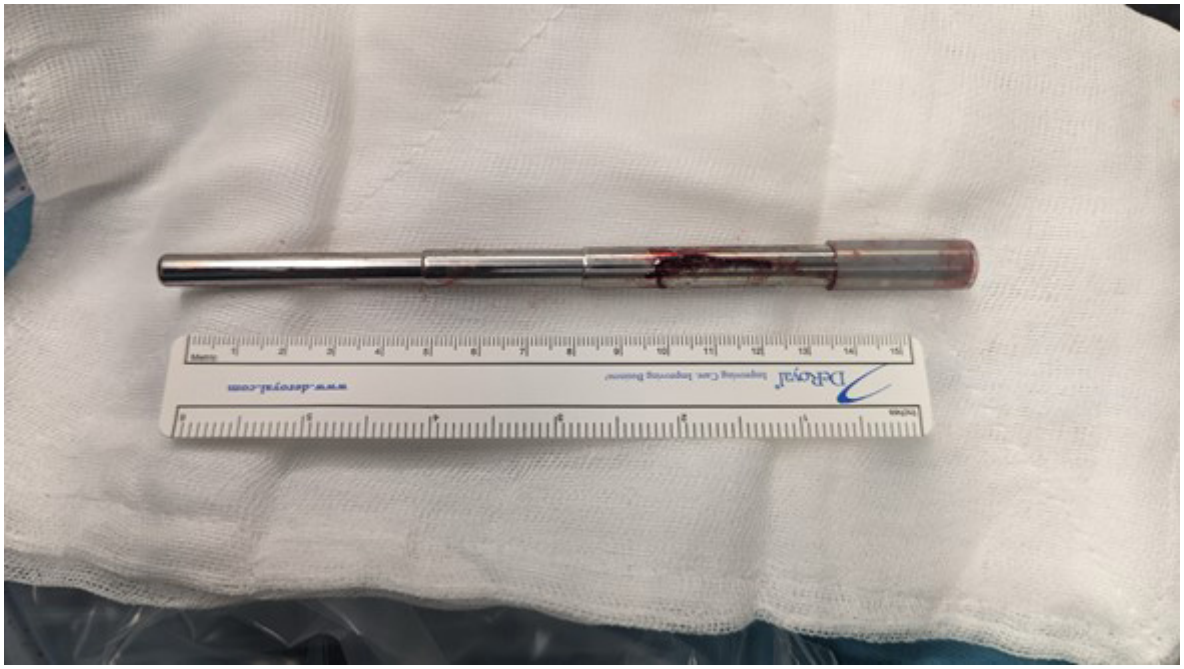


Figure 2: Intraoperative images demonstrating foreign body following removal.



children is likely under-reported and underestimated due to many oropharyngeal injuries being unwitnessed or managed without medical practitioner review.[1] In a single-centre review of 144 patients with penetrating oral cavity injuries, the soft palate was involved in 44.4% of cases followed by the hard palate in 18.1% of cases.[7] The most common mechanism for impalement injuries in paediatric patients is from falling with an object in the mouth.[7] Commonly reported objects include toothbrushes, toys, cooking utensils, stationary and sticks.[7]

Imaging in the evaluation of penetrating palatal injuries is controversial and most commonly considered to assess vascular injury. Reports of sub-acute neurological compromise from internal carotid artery injuries are rare but well described and there is debate in the literature regarding the use of imaging to assess for this.[1] Imaging strategies to evaluate for vascular injury vary from no imaging to ultrasound scan, plain film radiography, contrast CT and computed tomography angiography (CTA).[1,2] Factors that have been shown to increase the likelihood of a CTA being performed following oropharyngeal trauma include lateral injury, soft palate injury, increasing wound severity and otolaryngology consultation.[1] Despite this, the severity of the injury has not been shown to correspond with an increased likelihood of vascular injury or neurological sequelae.[1] In five large, recent studies, there was a 0.6% risk of internal carotid artery injury (2/335) and 0% incidence of neurological sequelae.[1–5] Severe neurologic sequelae have been documented from minor and seemingly innocuous soft tissue injuries and symptom onset is highly variable (3–60 hours post-event).[1,5] Due to the paucity of literature and heterogeneity of presentations, it is difficult to recommend an optimal management strategy for radiological assessment.[1] Soose et al. rationalise using CTA in practice due to its relatively low cost, accessibility, speed and low morbidity. They adopt an approach of obtaining CTA in all lateral soft palate and peri-tonsillar injuries regardless of severity.[1] In the absence of clear evidence in support for or against imaging, it is reasonable for an individual or institution to adopt either approach; however, the authors would advocate for a consistent management approach with local auditing of outcomes.

The clinical concerns in our case differed from soft palate oropharyngeal injuries, and imaging was obtained to determine the risk of intracranial injury and the potential need for neurosurgical input. In this clinical case, the patient was able to tolerate imaging despite her young age. If the patient was

not able to proceed with this, we likely would have abandoned cross-sectional imaging and prioritised transfer. While helpful, cross-sectional imaging before the transfer was not essential, and we would not have advocated for sedation while the patient was still in a rural setting with a potentially compromised airway.

The majority of oropharyngeal penetrating wounds do not necessitate operative intervention. Rates of surgical intervention for oral cavity and oropharyngeal trauma range from 6 to 11%, primarily for closure of gaping wounds with additional indications including haemostasis, airway concerns and foreign body removal.[1–3] Given the relative rarity of foreign bodies penetrating the hard palate, there is no consensus on the preferred method for securing the airway. Previous reports have utilised techniques including removal before intubation, fibreoptic intubation and oral intubation around the foreign body.[8,9] Retrospectively, in an emergency airway situation and with the knowledge of no obvious intracranial penetration of the foreign body, consideration of foreign body removal and intubation may have been considered if this situation had occurred. If the foreign body had been removed before arrival at our centre, a decision likely would have been made to proceed to the theatre for examination under anaesthesia due to the location of injury and difficulty in obtaining a reliable clinical assessment in this age group.

The use of antibiotics in oral cavity and oropharyngeal traumatic injuries is common (70–89%[1–5]); however, evidence to support their use is limited.[1] In a single-centre study of 205 cases, only three patients (1.4%) developed infection. In a case series of nine rural patients, two patients (22.2%) had complications of infection with both instances attributable to retention of fragments of organic material following foreign body removal.[10,11] No trials have investigated the benefit of prophylactic antibiotics following mucosal injury in preventing deep space neck infection. There is limited evidence to provide consensus guidelines regarding the use of antibiotics. Either approach is justifiable; however, the authors would advocate for a consistent management approach with local auditing of outcomes.

Conclusion

This case highlights complexities associated with the management of paediatric patients with potentially compromised airways in rural settings and the potential dangers of rigid drinking straws for young children. Impalement injuries from drinking straws have been documented but, historically, have been relatively uncommon.[7] Rigid drinking straws will likely become increasingly common with the continued phasing out of single-use plastics. Clinicians and parents should be made aware of the associated risks.

COMPETING INTERESTS
The authors declare no conflict of interest in preparing this article.

AUTHOR INFORMATION
Dr Jacob Arahill-Whitham, MB ChB: Otolaryngology Registrar, Health New Zealand – Te Whatu Ora Southern, Dunedin, New Zealand.
Dr Hitesh Tailor, MB BS: Otolaryngology Fellow, Health New Zealand – Te Whatu Ora Southern, Dunedin, New Zealand.
Mr Dean Ruske, MB ChB FRACS: Consultant Otolaryngologist, Otolaryngology, Health New Zealand – Te Whatu Ora Southern, Dunedin, New Zealand.

CORRESPONDING AUTHOR
Dr Jacob Arahill-Whitham, MB ChB: Otolaryngology Registrar, Health New Zealand – Te Whatu Ora Southern, Dunedin, New Zealand.
E: jbarahill@gmail.com

URL
https://nzmj.org.nz/journal/vol-138-no-1617/emergency-management-in-a-regional-setting-of-a-paediatric-patient-with-penetrating-injury-of-the-hard-palate-from-a-metal-drink

REFERENCES
1. Soose RJ, Simons JP, Mandell DL. Evaluation and management of pediatric oropharyngeal trauma. Arch Otolaryngol Head Neck Surg. 2006 Apr;132(4):446-51. doi: 10.1001/archotol.132.4.446.
2. Ratcliff DJ, Okada PJ, Murray AD. Evaluation of pediatric lateral oropharyngeal trauma. Otolaryngol Head Neck Surg. 2003 Jun;128(6):783-7. doi: 10.1016/S0194-59980300091-3.
3. Schoem SR, Choi SS, Zalzal GH, Grundfast KM. Management of oropharyngeal trauma in children. Arch Otolaryngol Head Neck Surg. 1997 Dec;123(12):1267-70. doi: 10.1001/archotol.1997.01900120011001.
4. Radkowski D, McGill TJ, Healy GB, Jones DT. Penetrating trauma of the oropharynx in children. Laryngoscope. 1993 Sep;103(9):991-4. doi: 10.1288/00005537-199309000-00009.
5. Hellmann JR, Shott SR, Gootee MJ. Impalement injuries of the palate in children: review of 131 cases. Int J Pediatr Otorhinolaryngol. 1993 Mar;26(2):157-63. doi: 10.1016/0165-5876(93)90021-t.
6. Samuthrat T, Ye K, Tong Y. Transoral Intracranial Injury via Middle Skull Base by a Blunt Chopstick in a Child. World Neurosurg. 2017 Jul;103:952.e11-952.e17. doi: 10.1016/j.wneu.2017.04.084.
7. Matsusue Y, Yamamoto K, Horita S, et al. Impalement injuries of the oral cavity in children. J Oral Maxillofac Surg. 2011 Jun;69(6):e147-51. doi: 10.1016/j.joms.2010.12.027.
8. Edem BE, Adekwu A, Efu ME, et al. Anaesthetic and surgical management of airway penetrating injuries in children in resource-poor setting: Case reports. Int J Surg Case Rep. 2017;39:119-122. doi: 10.1016/j.ijscr.2017.07.047.
9. Poutoglidis A, Tsetsos N, Forozidou E, et al. Eight Month-Old-Infant Impaled by Toothbrush Through the Hard Palate. Indian J Otolaryngol Head Neck Surg. 2023 Jun;75(2):1177-1179. doi: 10.1007/s12070-022-03402-9.
10. Hennelly K, Kimia A, Lee L, et al. Incidence of morbidity from penetrating palate trauma. Pediatrics. 2010 Dec;126(6):e1578-84. doi: 10.1542/peds.2010-1059.
11. Syebele K, Van Straten C, Chidinyane L. Oral and oropharyngeal impalement injury in pediatric patients--focus on rural environment. Int J Pediatr Otorhinolaryngol. 2012 Aug;76(8):1113-6. doi: 10.1016/j.ijporl.2012.04.010.