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# The Toothbrush: A Rare but Potentially Life-Threatening Cause of Penetrating Oropharyngeal Trauma in Children

Toru Sasaki, MD<sup>a</sup>, Sayaka Toriumi, MD<sup>a</sup>, Takahiro Asakage, MD<sup>a</sup>, Kimitaka Kaga, MD<sup>a</sup>, Daisuke Yamaguchi, MD<sup>b</sup>, Naoki Yahagi, MD<sup>b</sup>

Departments of <sup>a</sup>Otolaryngology and Head and Neck Surgery and <sup>b</sup>Emergency and Critical Care Medicine, University of Tokyo, Tokyo, Japan

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## ABSTRACT

We present the case of a 10-year-old girl with pharyngeal injury caused by a toothbrush, the snapped head of which lodged in her upper oropharyngeal wall. Initial examination of the oral cavity did not reveal bleeding, a foreign body, or a wound. Nasopharyngoscopy showed lodgment of the toothbrush piece in the upper oropharynx, pulsating in synchrony with heartbeats. Computed tomography showed the toothbrush head near the carotid artery. The foreign body was surgically removed without any intraoperative or postoperative complications. The diagnosis and management of oropharyngeal injuries by stick-like foreign bodies, such as a toothbrush or chopsticks, are discussed.

A STICK-LIKE OBJECT such as a toothbrush may cause injury of the oropharynx, particularly in children. Penetration of the oropharyngeal wall by a foreign body may cause intracranial damage and can be a life-threatening injury. However, such injury could escape diagnosis at the emergency department. Especially when the object is broken, the missing part lodged in the head and neck region can be overlooked. Here we present an uncommon case of a 10-year-old girl with pharyngeal injury caused by a toothbrush.

## CASE REPORT

A 10-year-old girl was having her teeth brushed by her mother when she lost consciousness and collapsed from unknown cause(s). The toothbrush snapped, and its head (which was thought to be inside the girl's mouth) disappeared. Although the girl soon recovered consciousness, she remained drowsy and could not speak. She was brought by ambulance to our emergency department.

The missing toothbrush head was not found inside the mouth. Visual inspection of the oral cavity and the pharynx was unremarkable. No sign of injury such as laceration, abrasion, contusion, or bleeding was noticed inside the oral cavity. There was no sign of emphysema, and palpation of the neck was unremarkable. At that point, we presumed that the toothbrush head had been swallowed or aspirated. Nasopharyngoscopy through the nose showed a toothbrush piece lodged in the upper oropharynx that pulsated in a synchronized rhythm

with the heartbeat. Judging from the toothbrush handle left behind, the missing part was larger than the piece identified by fiberscopy, implying that the foreign body had penetrated the pharyngeal wall. The actual site of penetration could not be detected because it was hidden by the toothbrush piece itself. An intracranial injury was suspected, but no neurologic symptoms were noted by a neurosurgeon during physical examination.

Urgent computed tomography (CT) showed that the toothbrush head had penetrated the right parapharyngeal space and reached as deep as the vicinity of the right internal carotid artery (Fig 1A). However, it did not penetrate the artery. Emphysema was noted to be spreading from the level of penetration to the mediastinum (Fig 1B). The emphysema seemed too extensive to be caused merely by the initial blow, and we suspected that the toothbrush functioned as a check valve, allowing air entry by intrathoracic negative pressure during inspiration but preventing its escape during expiration. Examination of the central nervous system showed no organic lesion. On the basis of the CT findings, we con-

**Key Words:** toothbrush, foreign body, pharyngeal injury, vagal syncope

**Abbreviation:** CT, computed tomography

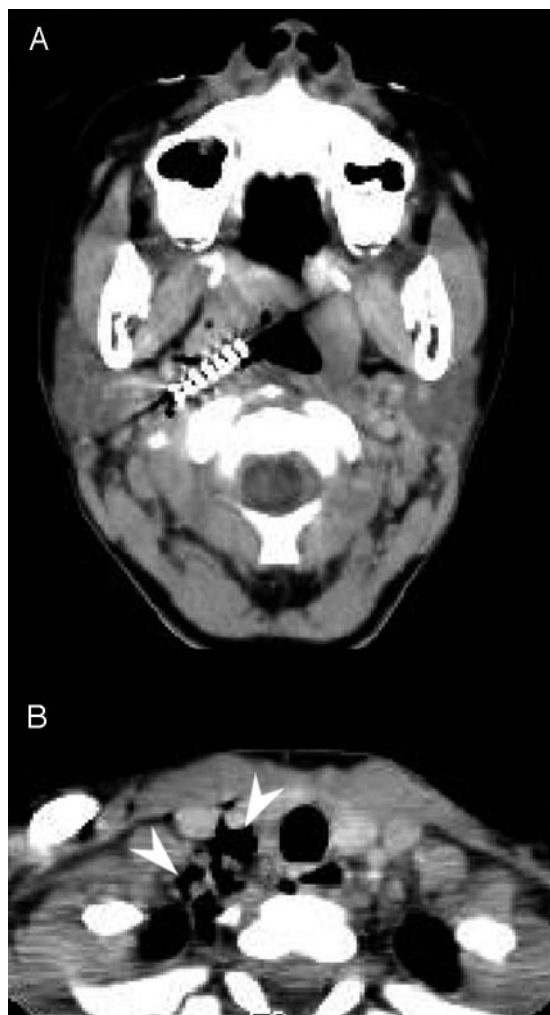
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Address correspondence to Toru Sasaki, MD, Department of Otolaryngology and Head and Neck Surgery, Faculty of Medicine, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8655, Japan. E-mail: rxv10313@nifty.com

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**FIGURE 1**  
A, CT showing the toothbrush head penetrating the right parapharyngeal space. B, Extensive emphysema spreading from the level of penetration to the mediastinum (arrowheads).

cluded that simple removal of the foreign body was indicated and that the risk of bleeding from the internal carotid artery was low.

The patient was taken to the operating room, and under general anesthesia, the toothbrush head was removed without additional tissue damage or bleeding. The wound was left open. Postoperatively, the patient was admitted to the ICU and remained intubated. CT performed on day 7 showed complete disappearance of the emphysema, and the patient was extubated on day 8. Videofluorography confirmed wound closure and excluded any dysphagia. The patient was discharged on day 14 without any complications.

## DISCUSSION

A toothbrush is one of the most familiar commodities of everyday use, and few people would ever think about the risk of using it. Some cases of accidental swallowing of a toothbrush have been reported,<sup>1,2</sup> and some have

required surgical removal.<sup>3,4</sup> However, such an accident seldom becomes fatal. A toothbrush foreign body causing severe oropharyngeal injury is very rare, and to our knowledge, only one similar case<sup>5</sup> has ever been reported, although several accidents caused by chopsticks are reported in some Asian countries including Japan.<sup>6-9</sup> Unlike chopsticks, toothbrushes are worldwide-used commodities regardless of age, gender, and ethnicity, and our case provides a warning that a toothbrush may cause a life-threatening injury, especially in children. The retropharyngeal tissue is soft enough to allow injury of the carotid artery, and a foreign body could easily dislodge through this tissue.<sup>10</sup>

One may question why the mother was brushing her 10-year-old daughter's teeth. Was considerable force used to cause this injury? Is there a possibility of child abuse? Detailed history taking indicated that the girl usually brushed her teeth by herself, but the mother also brushed the child's teeth on a routine basis to prevent dental caries. It is likely that the girl fainted suddenly; the weight of her body during her collapse broke the toothbrush held by the mother and resulted in penetration of the toothbrush head into the nasopharyngeal wall. However, child abuse should be always considered in such cases,<sup>11</sup> although in our case there was no evidence for this on the basis of history and physical examination.

The risk of vagal syncope during toothbrush use should be considered. It is possible that fainting was induced by vagal nerve stimulation caused by toothbrush movement. This assumption is based on the lack of history suggestive of any central nervous system disease such as epilepsy. In addition, no neurologic symptoms were recognized after the syncope, and CT of the brain did not show any organic lesions.

Cases with suspected injury require CT examination of the head and neck. When CT suggests the involvement of the carotid artery, simple removal of the foreign body is contraindicated, because it may cause fatal arterial bleeding. Angiography is useful to rule out penetration of the artery. Penetration of the arterial wall by the foreign body is more serious, obviously, and would require immediate repair, although urgent ligation of the carotid artery should be considered as the last resort when bleeding is uncontrollable.

The most anticipated postoperative complication is mediastinal infection. For the management of cases such as ours, we recommend intubation as long as the risk of mediastinal infection remains, because intubation prevents a sudden increase in pharyngeal pressure, such as with coughing. We decided to extubate the patient on day 8 on the basis of improvement of upper-airway edema, closure of the pharyngeal wound as determined by nasopharyngoscopy, and complete disappearance of the emphysema on CT examination. Prophylactic use of antibiotics is still controversial for cases that are free of

retropharyngeal abscess or mediastinal infection,<sup>11</sup> but for serious cases like ours, we recommend at least one course of antibiotics to prevent possible mediastinal infection. However, the exact duration of treatment will depend on the individual case. Agents that are effective against anaerobic bacteria, such as clindamycin, should be considered, because mediastinal abscesses are often caused by anaerobes such as *Bacteroides* species.<sup>12</sup> When these efforts fail and a mediastinal abscess forms, thoracotomy should be considered for lavage and drainage.<sup>13</sup>

There is no effective prevention of this kind of accident other than supervising children. We emphasize the importance of parents watching their children carefully when they are brushing their teeth. Our case is didactic in that the foreign body could have been overlooked without careful inspection of the head and neck region. This mandates a high level of suspicion on the basis of history, nature of the object, and physical findings. Palpation of the neck is recommended for detection of possible subcutaneous emphysema. In similar cases, the risk of the residual foreign body must not be underestimated, and CT of the head and neck regions should be obtained, keeping in mind possible injury of vital organs such as the brainstem, cerebellum, or carotid artery.

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