A needle in a haystack: Report of a retained archwire fragment in the pterygomandibular space

Carolyn B. Bradford,[a] Bhavna Shroff,[a] Robert A. Strauss,[b] and Daniel M. Laskin[b]
Richmond, Va

This clinical report describes a retained archwire fragment, discovered during a new-patient examination of a young woman seeking orthodontic retreatment. The diagnostic process, care coordination, and patient management decisions are discussed, along with a brief exploration of clinical considerations associated with this incident. A suggested emergency prevention and response protocol is also presented. (Am J Orthod Dentofacial Orthop 2019;155:881-5)

This case report describes a retained fragment of orthodontic wire discovered as an incidental radiographic finding. The interdisciplinary management of the problem, emphasis of the importance of high-quality record-taking, and a discussion of practice systems designed to prevent and respond to such events are all presented. Aspiration, ingestion, and iatrogenic damage can all lead to situations in which a foreign body is retained in the course of dental treatment. Prevention is the best way to avoid such negative sequelae, especially because potentially life-threatening emergencies can ensue as a result. The foreign body type, severity of possible sequelae, invasiveness of potential intervention, psychologic burden on affected patients, and litigious repercussions for practitioners are all reasons to ensure that one's office operates to minimize the risk of foreign body retention.[1]

DIAGNOSIS AND ETIOLOGY

A healthy, 21-year-old woman presented to the Virginia Commonwealth University Orthodontics Clinic in January 2018 with a chief complaint of treatment relapse. She reported a history of orthodontic treatment ~10 years earlier at the office of her general dentist.

Clinical examination revealed previous nonextraction orthodontic treatment, an Angle Class I malocclusion, and mild anterior crowding in the maxillary and mandibular arches. She had a full complement of permanent dentition, except for the third molars, which had been extracted in October 2016.

Review of the panoramic radiograph during treatment planning revealed a thin, linear radiopacity, measuring ~15 mm in length, in the region of the inferior portion of the right mandibular ramus, appearing to cross the mandibular canal (Fig 1). A corresponding ghost image was noted on the contralateral side of the radiograph. The lateral cephalogram appeared to show the same radiopacity (Fig 2).

The initial differential diagnosis included an embedded anesthesia needle, possibly associated with an inferior alveolar nerve block delivered to perform the occlusal restorations noted in the mandibular right first and second molars and a retained fragment of orthodontic archwire from her previous treatment.

At the orthodontic consultation appointment with the patient and her mother, all radiographs were reviewed, and the patient was asked if she could account for the presence of the radiopacity. She stated that she was "in shock," and recounted a specific dental appointment when she was 12 or 13 years old, at which time a new dental assistant at her general dentist's office was inserting the archwires. She indicated that the doctor had instructed the assistant to cut the wire before insertion, but the assistant had not followed the doctor's directive. She reported that she was aware of the

[a]Department of Orthodontics, Virginia Commonwealth University, Richmond, Va.
[b]Department of Oral and Maxillofacial Surgery, Virginia Commonwealth University, Richmond, Va.
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Address correspondence to: Carolyn B. Bradford, Resident, Department of Orthodontics, Virginia Commonwealth University School of Dentistry, 520 North 12th Street, Rm 111, Box 980566, Richmond, VA 23298-0566; e-mail, bradfordc@vcu.edu.
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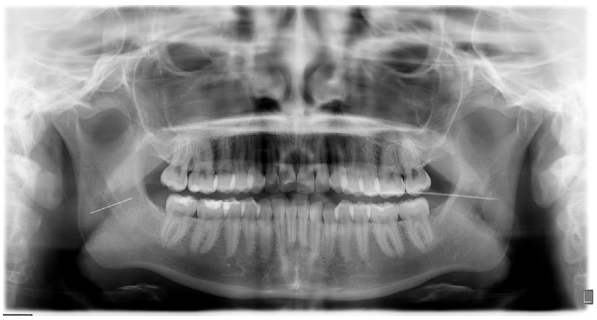

Fig 1. Patient 1. Panoramic radiograph from initial orthodontic records dated January 28, 2018, showing the foreign object on the right side.

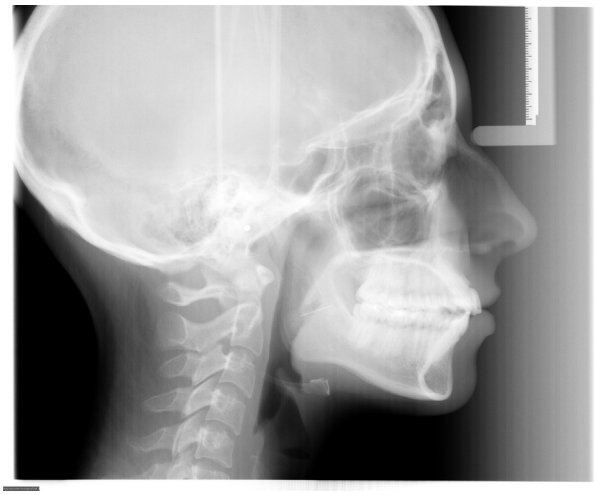

Fig 2. Patient 1. Lateral cephalogram from initial orthodontic records, dated January 28, 2018, showing the foreign object.

long wire ends, and, when the assistant cut the right side of the wire, she felt an instantaneous, sharp, shooting pain in her right cheek. She said that the assistant, multiple other office staff, and the doctor had attempted to find the wire fragment. The patient's mother added that the doctor had advised taking an x-ray—although she could not remember the type or if it was ever taken. She was then sent home. No mention was made of follow-up efforts on behalf of the doctor regarding the missing wire fragment. When asked at our consultation, the patient reported that there were no symptoms associated with the retained wire, neither immediately after the incident nor at any point afterward.

OBJECTIVES

After identifying the foreign object as a retained archwire fragment, initiation of orthodontic treatment was postponed until a decision could be made regarding management of the embedded wire. It was arranged for the patient to have a consultation in the Virginia Commonwealth University Oral and Maxillofacial Surgery Clinic for advice regarding removal versus maintenance of the wire fragment. Cone-beam computed tomography (CBCT) was recommended to spatially localize the foreign object.

PROGRESS

At the surgical consultation, CBCT was performed, and the wire fragment was noted to be medial to the right mandibular ramus (Figs 3 and 4). It was determined that the best course of action was to not attempt recovery of the wire fragment at that time, given the asymptomatic status, the close proximity of the fragment to the lingual nerve, and the risk of nerve damage with attempted retrieval. The surgeons opted to radiographically monitor the wire fragment at 6-month to 1-year intervals to assess for any changes in position.

A new CBCT was taken 6 months after the initial CBCT, and no changes in the position of the wire fragment were noted, suggesting that the wire fragment was stable in its position at that time (Fig 5).

SUPPLEMENTAL CASE REPORT

A few months later, another incidence of a retained wire fragment was discovered in our clinic. A 10-year-old girl had just completed phase I orthodontics to correct an anterior crossbite of the maxillary lateral incisors. Review of the deband records showed a short linear radiopacity on the panoramic film, located coronal to the unerupted mandibular right second molar (Fig 6). Just before debanding, the patient had a 0.016 × 0.022 stainless steel lower archwire, with tip-back bends mesial to the mandibular first permanent molars and cinched distal to the molar tubes. Clinical suspicion was very high that the radiopacity was the cinched end of the right side of the lower wire. The cinched ends had been clipped to permit removal of the wire, and the fragment was apparently embedded superficially in the gingiva distal to the mandibular right first permanent molar. The patient and her mother were immediately notified of the presence of a suspected wire fragment. Because the wire fragment could not be visualized intraorally and excessive palpation risked embedding the fragment more deeply (Fig 7), the patient was walked to the Oral and Maxillofacial Surgery Clinic for evaluation. Limited-field CBCT was performed, confirming the presence of a 1.5-mm stainless steel wire fragment in the superficial gingiva distal to the mandibular

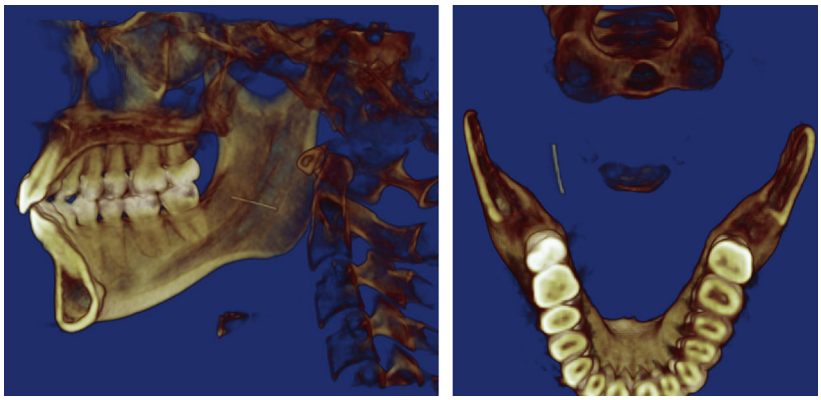

Fig 3. Patient 1. Images constructed from the CBCT dated March 1, 2018, showing archwire fragment located lingual to the right mandibular ramus: left, sagittal and right, axial views.

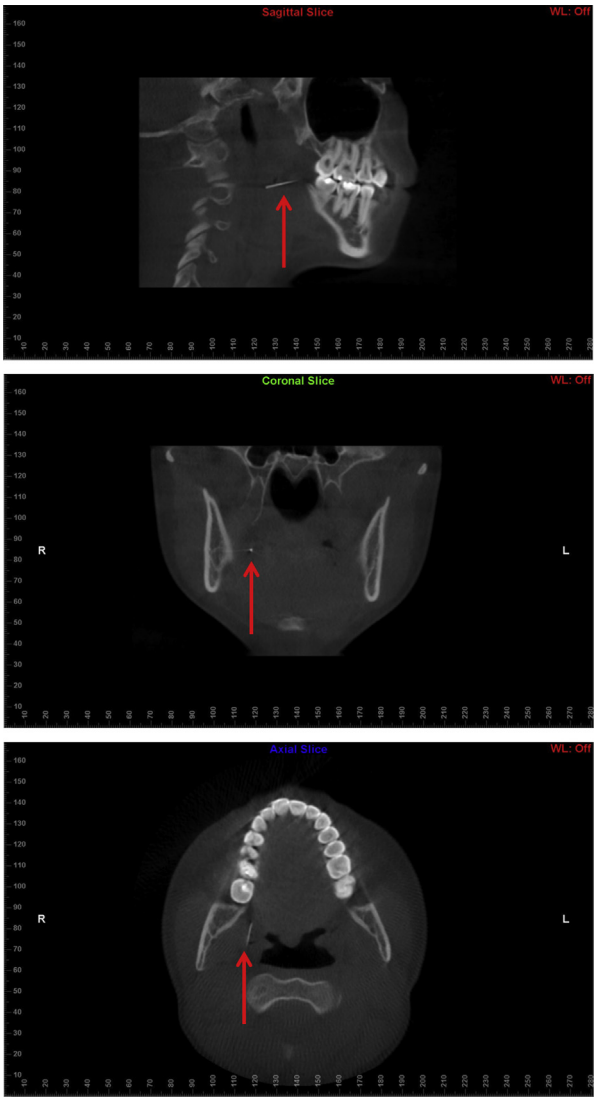

Fig 4. Patient 1. March 1, 2018, CBCT (red arrows): top, sagittal slice; middle, coronal slice; and bottom, axial slice.

right first permanent molar. The wire fragment was uneventfully recovered by the surgeon via a small gingival incision. No negative sequelae were observed.

DISCUSSION

The first case in this report serves as an example of inadequate measures taken on the part of the dentist to respond to the apparent loss of a large orthodontic wire fragment. A diagnostic radiograph—a panoramic film or CBCT—should have been taken, with immediate referral to an oral and maxillofacial surgeon if the anterior end of the wire fragment could not be grasped intraorally. Verbal and radiographic follow-up with the patient regarding this specific incident should also have been completed by the doctor.

The importance of thorough examination of initial and progress records is also highlighted by this case. The supplemental case report exhibits the importance of reviewing all final records carefully and demonstrates appropriate patient care best practices in the event of a retained fragment of orthodontic archwire.

Many orthodontic offices develop specific protocols for everyday tasks as well as emergency responses. We recommend that all orthodontists establish clear protocols both for minimizing the risk of swallowing, aspiration, or retention of foreign objects and for responding to such an event should it occur. One suggested protocol is as follows:

- Clearly explain to the patient the procedure that is about to occur.
- Encourage the patient to breathe through their nose when possible.
- When handling small objects in the patient's mouth, consider using a gauze throat pack or ligating the

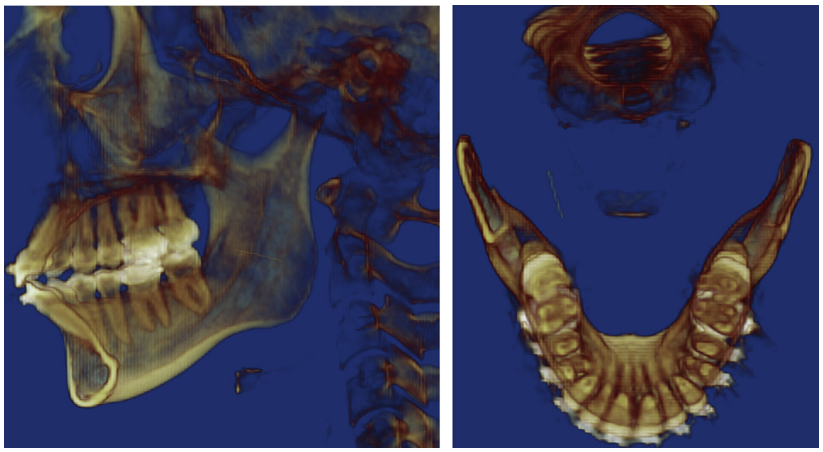

Fig 5. Patient 1. Images constructed from the CBCT taken 6 months after CBCT in Fig 3. No apparent movement of the wire fragment was observed when the 2 CBCTs were compared. Left, sagittal and right, axial views.

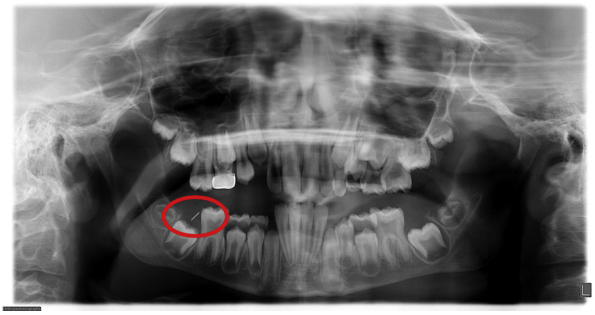

Fig 6. Patient 2. Phase I deband panoramic radiograph showing a retained wire fragment embedded in the gingiva distal to the mandibular right first permanent molar (red circle).

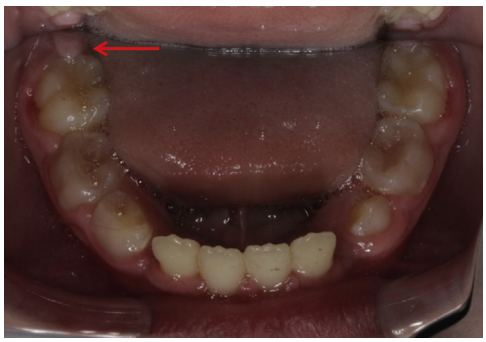

Fig 7. Patient 2. Intraoral photograph of the mandibular arch, showing redundant gingival tissue distal to the mandibular right first permanent molar, in the region of the retained wire fragment found in Fig 6 (red arrow). No visualization of the wire fragment was noted clinically.

object with dental floss to minimize intraoperative swallowing and aspiration risks.

- Instruct the patient to turn their head to the side should an object fall into the mouth to prevent the object from moving toward the throat.
- When a dropped object is readily visualized, the operator must use their judgement to determine if and how retrieval should be attempted.
- If the patient swallows an object, the patient and parent must be notified immediately. The recommendation should be given to visit an emergency room for chest/abdominal imaging.
- If the patient aspirates an object and is choking, cardiopulmonary resuscitation (CPR) must be started immediately and emergency personnel summoned (call 9-1-1). If the aspirated object is not causing choking, the patient or parent must be notified immediately, and they must go to an emergency room for chest imaging.

It must also be emphasized that merely having such protocols is not sufficient. All doctors and staff in the office must be familiar with the procedures to effectively serve their purpose.

Various case reports exist in the dental and medical literature describing embedded, ingested, aspirated, and otherwise retained materials. Depending on foreign body type, suspected localization, and age of the patient, management recommendations are often based on case specifics, because such events are generally rare.

Although no other report of an embedded archwire fragment was found on review of the orthodontic literature, the most similar documented events, from a management standpoint, are cases of broken

hypodermic needles. In 2017, Giurintano et al described a case in which a needle was retained in the mucosa of a 52-year-old man after multiple teeth were extracted by a general dentist. After development of pain and trismus, computed tomographic (CT) imaging revealed a thin metallic object piercing the internal carotid artery lumen. Transoral exploration was unsuccessful at retrieving the needle, and the foreign object was found to have migrated farther, entering the jugular foramen. Successful removal of the needle was ultimately accomplished with a microsnare and balloon catheter during a cerebral angiogram.[2] The anatomic location of the broken needle and its metallic nature somewhat parallels the incident described in the present case report.

Regarding management of embedded hypodermic needles, Giurintano et al reported that retrieval under general anesthesia is the current recommendation, noting that delay in retrieval can result in migration of the foreign object.[2] Intraoperative CT or fluoroscopy is recommended to guide surgical retrieval procedures. The lack of evidence of migration of the archwire fragment in the case of our first patient supports the surgeons' recommendation to not attempt retrieval at this time.

The clinical report presented here raises the issue of the duties that dental assistants can perform and the orthodontist's responsibility for overseeing such activities. State dental boards vary in their definitions of "delegable" and "nondelegable" duties for dental assistants. The assistant placing the archwire was indeed practicing within her legal scope, yet an undesirable outcome still occurred. Thus it is clear that even "delegable" activities should still be actively overseen by the orthodontist.

Although formal rules and regulations can either incriminate or exonerate a practitioner in equal measure, orthodontists have an obligation to critically evaluate which delegable tasks really should and should not be delegated. This case report underscores the critical role that the doctor must play in a specialty that relies so heavily on delegation of tasks for efficiency. We can not let a desire to improve our bottom line eclipse the fact that all aspects of patient care are our responsibility.

CONCLUSIONS

1. Orthodontists must be cognizant of their responsibility for all actions occurring in the office. Delegation of tasks must be done in a manner conducive to oversight by the clinician.
2. Dental professionals must take seriously the duty to inspect all records taken, leaning on the expertise of other dental professionals when needed.
3. Orthodontists must ensure that all doctors and staff members are properly trained to deliver the highest standard of patient care, minimize risks, and respond properly to emergencies.
4. If it is suspected that a patient swallowed an object during a procedure, the patient should be referred for chest/abdominal radiography and any other imaging deemed to be necessary.
5. If a patient aspirates an object during a procedure and is choking, CPR must be initiated immediately. In the event of aspiration with no evidence of choking, referral to an emergency room for imaging is indicated.

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