

CASE REPORT OPEN ACCESS

A Case of a Metal Foreign Object Remaining in the Maxillary Bone for an Extended Period: A Case Report

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ABSTRACT

We report a rare case in which a metallic foreign body remained undetected in a patient's maxilla for nearly 40 years after a childhood bicycle accident. Despite the accident, the implant remained in place without causing infection due to the lack of imaging studies at the time. The metal was accidentally discovered during a routine dental imaging examination 40 years later and subsequently surgically removed. This case highlights the importance of comprehensive imaging and the dangers of overlooking foreign bodies, especially in the vulnerable head and neck region. The patient, 53 years old at the time of discovery, presented to the dentist due to discomfort in the palate and nasal cavity. During this visit, radiographs were taken and a foreign body was discovered. Surgical removal of the foreign body revealed significant corrosion and surrounding granulation tissue indicative of foreign body granuloma. Elemental analysis of the foreign body confirmed that it was an iron-based metal, unlike biocompatible materials such as titanium. These findings reinforce the need for close post-trauma evaluation and follow-up, especially in cases of pediatric trauma, to avoid the possibility of long-term complications arising from unnoticed foreign bodies in anatomically significant areas.

JEL Classification: Oncology

1 | Introduction

The head and neck region comprises intricate anatomical structures, including blood vessels, nerves, airways, and the auditory and visual systems. This region also encompasses the tongue, jaw, and pharynx. The head—especially the face—and the neck are generally exposed to the external environment. The oral cavity opens to the exterior every time we breathe or eat, making these areas prone to trauma and at a higher risk of contamination than other body parts [1]. Injury often allows foreign bodies to enter through damaged barriers. Diagnostic imaging techniques, such as CT scans and MRI, performed during a hospital visit, are crucial for detecting and extracting retained foreign objects [2]. Trauma-related foreign bodies carry a significant risk of infection and can lead to chronic disabilities [3, 4].

Complications, such as spontaneous pain, impaired wound healing, abscesses, fistulas, and potential foreign body migration, might emerge over time [5]. Thus, the prompt detection and removal of foreign bodies post-injury are critical components of trauma management.

In some instances, the entry of foreign bodies may not be apparent. There are cases where foreign bodies exhibit minimal or no clinical symptoms, leading physicians to potentially overlook the presence of a foreign body injury. Anderson et al. reported that 38% of soft tissue foreign bodies were initially undetected during assessments of hand injuries [3]. Numerous reports have documented instances of foreign bodies remaining asymptomatic within the body for extended periods following medical interventions, such as surgeries [6]. Nevertheless, it is exceedingly

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Summary

- The importance of imaging for foreign body retrieval during trauma and the danger of overlooking foreign bodies in the head and neck region are emphasized.
- In children, the chief complaint alone may not reveal the details of the trauma, underscoring the need for a thorough posttraumatic evaluation.



FIGURE 1 | Initial oral examination photo. No abnormalities were observed in the oral mucosa where discomfort was felt.

rare for foreign bodies introduced through trauma to remain symptom-free. Typically, these are identified shortly after their introduction due to infections causing inflammation.

This case report describes an incident in which a metal foreign body entered the maxilla during a childhood bicycle accident. At the time of the injury, detailed imaging studies were not performed, and the metal object went undetected. Remarkably, it remained embedded in the maxillary bone for many years without causing any infection. After 40 years, the foreign body was incidentally discovered during an imaging examination for dental treatment and was subsequently surgically removed.

2 | Case History/Examination

A 53-year-old male presented to the dental clinic with discomfort extending from the left side of the palate to the nasal cavity. His medical history included childhood meningitis and a left vestibular schwannoma, both resolved favorably. An X-ray examination at the clinic revealed an opaque image on the left side of the palate, prompting a referral to our hospital's oral surgery department. The clinical examination revealed no significant findings in the oral cavity or surrounding areas (Figure 1). The

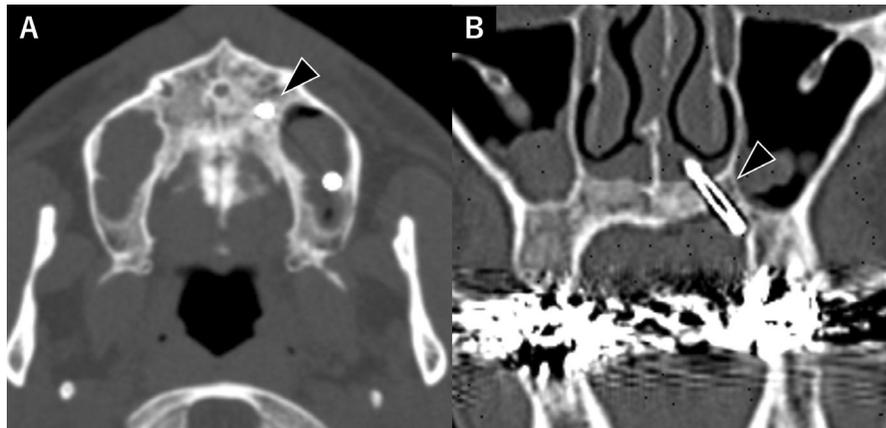


FIGURE 2 | CT images taken 5 years ago. (A) horizontal section. (B) coronal section. A rod-like radiopaque image was observed extending from the left palatine bone to the floor of the nasal cavity (arrow). Additionally, a small amount of radiolucency was observed around the bone. The radiopaque image had penetrated the palatine bone, with both ends reaching the palatal and nasal mucosa. No signs of osseous sclerosis suggesting infection in the surrounding maxillary bone were observed.

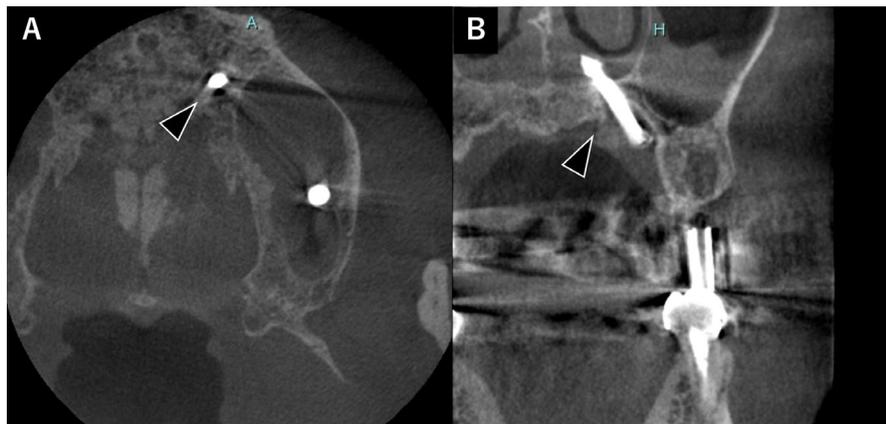


FIGURE 3 | Initial CT imaging. (A) horizontal section. (B) coronal section. A radiolucent image similar to the one taken 5 years ago is observed.

gingival mucosa of the left maxillary premolars showed no abnormalities or palpable foreign objects.

Five years earlier, the patient visited our department's prosthodontics division for dental treatment, and similar radiopaque substances were also observed in the CT images taken at that time (Figure 2A,B). Since no symptoms were reported at that time, it was monitored over time. Further detailed medical history uncovered an oral injury from a childhood bicycle accident. It was suspected that a foreign object had inadvertently been introduced during the accident. However, no detailed imaging examinations were conducted at the time of the injury. No symptoms such as nasal congestion appeared until the visit to our clinic. It was concluded that the foreign object had remained in the maxilla for many years, eventually requiring removal under general anesthesia. The object was suspected to be metallic and long-standing. Given the potential for corrosion or disintegration, a dual approach from the oral and nasal sides was planned. An incision was made in the left palatal gingival sulcus, the palatal mucosa was dissected to expose the end of the foreign object, and the nasal floor

mucosa was lifted to reveal the tip of the metal piece from the nasal side.

3 | Investigations and Treatment

At the time of the initial examination, a CT scan was taken, which showed metal opacity spreading from the left palatine bone to the nasal cavity, and mild bone resorption was observed in that area (Figure 3A,B). Based on the characteristic radiopaque findings, the presence of a foreign object was strongly suspected rather than biologically derived calcification. Although the possibility of dental implant intrusion was also considered, there was no history of implant treatment. After many years, removal of the object under general anesthesia was finally necessitated. The object was presumed to be metallic and had likely been present for an extended period. Given the potential for corrosion or disintegration, a dual approach was adopted. An incision was made in the left palatal gingival sulcus, the palatal mucosa was dissected to expose the end of the foreign object, and the nasal floor mucosa was lifted to reveal the tip of the metal piece from the nasal side (Figure 4). Bone resorption was observed around the foreign body, and the formation of reactive granulation tissue was noted. The bone surrounding the metal on the palatal side was cut, and an attempt was made to remove the metal in one piece. Due to significant corrosion, however, the piece was also extracted through the nasal side. The presence of remaining metal fragments was confirmed using intraoperative X-ray imaging from two perspectives (Figure 5A,B). Granulation tissue surrounding the foreign object was excised, and the surgery was completed. The foreign object fragmented into multiple pieces during extraction, with rust-like features observed on the entire surface (Figure 6). Granulation tissue was present around the fragments.



FIGURE 4 | Intraoperative photograph. The palatal mucosa was dissected, exposing the palatal bone. Bone defects and intruded objects were observed in the area indicated by the white arrowhead.

4 | Outcome and Follow-Up

Elemental analysis of the extracted material revealed a rusted surface rich in iron (Fe) and oxygen (O), indicating significant corrosion (Figure 7A). Trace electrolytes commonly found in blood, such as sodium (Na), phosphorus (P), chlorine (Cl), potassium (K), and calcium (Ca), were also detected (Figure 7B). The basic composition of the uncorroded foreign object was

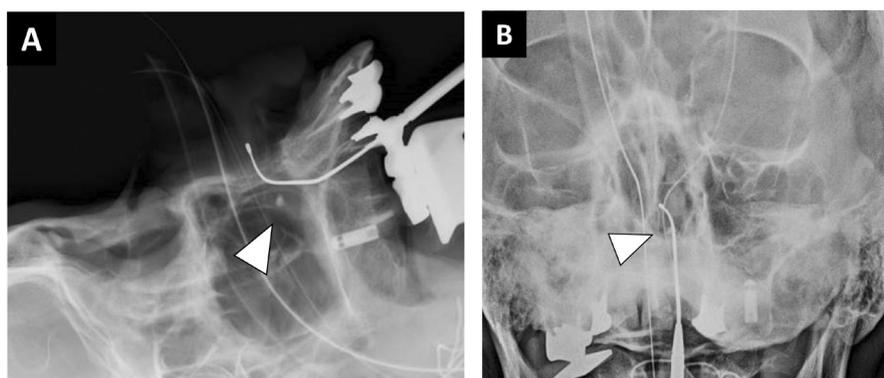


FIGURE 5 | Intraoperative plain radiograph. (A) frontal view. (B) lateral view. The foreign object was damaged due to corrosion, and its remnants were confirmed on the intraoperative radiograph. The insertion of an instrument clarified the position of the residual foreign body (arrow). The presence of residual foreign body at the arrow-indicated site led to its removal after imaging.

primarily iron, suggesting it was metallic iron rather than an alloy (Figure 7C). No abnormalities were detected at the surgical site, and the patient experienced a successful postoperative recovery.

5 | Discussion

Trauma in children is most commonly observed in the head and neck regions [7]. Whenever trauma occurs, clinicians must consider the possibility of foreign bodies remaining in these areas. In cases of pediatric trauma, information regarding the injury circumstances and clinical symptoms may not be adequately collected, increasing the risk of missed foreign bodies [8].

In this case, the patient had a bicycle accident during childhood that led to injuries in the oral cavity. Although these injuries were significant, they did not manifest any severe symptoms initially; thus, no imaging studies, such as CT scans, were conducted at that time. It is probable that a foreign object penetrated the maxillary bone as a result of the trauma. Years later, when the patient sought dental care and underwent X-ray diagnostics at a dental clinic, the images revealed an opaque object within the maxillary bone. Due to the absence of primary symptoms, a watchful waiting approach was adopted.

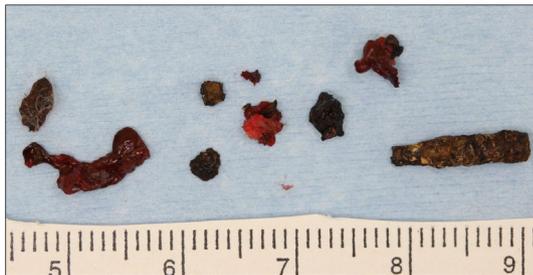


FIGURE 6 | Extracted foreign body. The foreign body was highly corroded and was damaged during extraction.

Typically, foreign bodies that remain within the body can lead to infections, often identified by symptoms of pain, inflammation, and purulent discharge [9]. If the symptoms are mild, the foreign body may persist for an extended period and be incidentally discovered during routine X-ray examinations [10]. There have been numerous reports of foreign bodies remaining asymptomatic within the body for long durations, especially following medical procedures like surgeries [6]. In the oral region, cases have been reported where metal used during dental treatment intruded into the surrounding tissues and remained asymptomatic [11].

It is uncommon for foreign bodies introduced due to trauma to remain without causing severe symptoms from infection or inflammation. Elemental analysis of the foreign body showed that its surface was rusted, with Fe being the predominant component. Biocompatible metals such as titanium (Ti) were absent.

When foreign bodies persist for extended periods, they can induce the formation of granulation tissue, leading to the development of a foreign body granuloma [12]. This process can allow the foreign body to remain embedded for a long time. The presence of granulation tissue around the extracted metal foreign body indicates that a foreign body granuloma had developed. Despite the injury occurring in childhood, there were no effects on the growth or morphology of the mandible.

Although the foreign body had remained since childhood, an infection developed for unknown reasons, prompting symptoms that led to a hospital visit. Following the extraction surgery, no abnormalities were detected in the wound area or the maxillary bone during subsequent follow-up observations.

When examining trauma, it is crucial to consider the possibility of foreign body entry, especially in pediatric patients where information gathering is limited. In this case, although no severe symptoms like infection were observed for a long time after the injury, the residual foreign body could still lead to serious infections. In the head and neck area, such complications can be life threatening, underscoring the need for more thorough examinations.

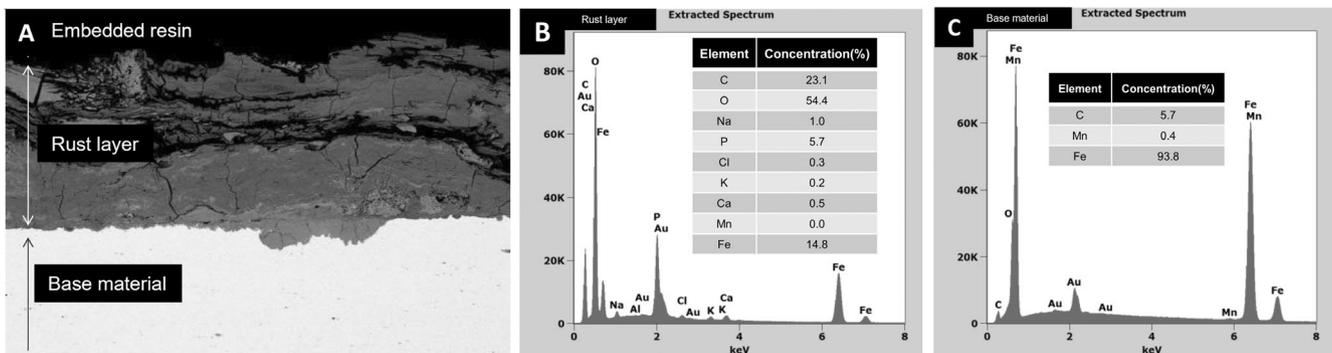


FIGURE 7 | Elemental analysis of the extracted foreign body. (A) electron microscope image of the cross-section of the extracted foreign object. (B) elemental analysis of the oxide film. (C) elemental analysis of the base material of the foreign object. A layer suspected to be an oxide film was observed on the surface of the base material of the foreign object. In addition to iron (Fe), which appears to be the main component of the foreign object, elements such as O, Na, P, Cl, and Ca, presumably derived from blood, were found adhering to it. The composition suggested an iron oxide film. A large amount of Fe along with Mn and C was detected from the base material of the foreign object, suggesting that the foreign object might be a metal primarily composed of Fe.

6 | Conclusion

The presence of undetected metallic foreign bodies in the maxilla for nearly 40 years is exceptionally uncommon. Typically, such foreign bodies are removed shortly after their entry into the maxilla due to trauma, following an acute inflammatory response triggered by infection. Here, we describe an unusual case where a metallic foreign body was inadvertently left in the maxilla. This case highlights the critical importance of thorough imaging and consistent follow-up in managing trauma, particularly in pediatric patients.

Author Contributions

Koichi Kadoya: investigation, writing – original draft. **Yuki Kunisada:** data curation, writing – review and editing. **Kyoichi Obata:** writing – review and editing. **Hiroaki Takakura:** resources, writing – review and editing. **Tatsuo Ogawa:** resources. **Soichiro Ibaragi:** supervision.

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Consent

The publication of this case report and accompanying images was explained in writing and informed consent was obtained. Signatures were obtained on the document. A copy of the consent form is available upon request to the Editor-in-Chief of the journal.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All the findings are present within the manuscript.

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