



C-Arm Assisted Surgical Foreign Body Removal in the Tongue: Evidence-Based Case Report

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Abstract

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Background : The term corpus alienum (foreign body) refers to an external object that should not be present within the human body. In managing such cases, X-rays are among the most important imaging modalities. To support surgical and orthopedic procedures, a mobile imaging device known as the C-Arm is often used. It provides real-time imaging during procedures involving bones or internal organs.

Case Report : A 51-year-old male presented with a staple lodged in his tongue. He previously underwent blind surgery by an oral surgeon at RSUD Salatiga, but the foreign body could not be located. The patient was referred to RSUP Dr. Kariadi Semarang and scheduled for C-Arm assisted removal under general anesthesia.

Discussion : Foreign bodies can cause discomfort and various symptoms. The C-Arm is a radiological device that provides real-time visualization using fluoroscopy and a monitor screen. With its assistance, the foreign body was accurately located and successfully removed from the tongue.

Conclusion : This case highlights the importance of imaging guidance in foreign body removal. The use of a C-Arm enabled precise localization and successful surgery after a previous failed attempt.

Keywords : corpus alienum, foreign body, C-Arm

INTRODUCTION

The term "foreign body" in the medical field refers to an external object that should not be present within the human body. The phrase originates from the Latin term "corpus alienum" and also describes the body's immune response to such objects. A rare occurrence involves foreign bodies lodged in the palate or other areas of the oral cavity, which can sometimes be misdiagnosed as other oral health conditions. Research shows that these incidents are most commonly experienced by children. The mouth serves as a primary route for foreign body accidents, especially in children under the age of three.^{1,2} In managing foreign body cases, X-rays are one of the most important medical imaging methods. Despite significant advancements in medical technology, X-rays remain widely used due to their effectiveness in detecting foreign bodies, fractures, and other medical conditions. X-rays work by exposing specific parts of the body to low doses of radiation to produce internal images. This imaging technology has also evolved into fluoroscopy, which allows doctors to observe real-time moving images of internal body structures. Fluoroscopy employs continuous X-ray beams directed at specific body parts, with the images displayed on a computer screen, enabling the observation of bodily movements.^{3,4}

To support procedures such as surgeries and orthopedic treatments, a mobile imaging device known as the C-Arm is often utilized. This device integrates fluoroscopy technology with computing capabilities to view, edit, store, and transfer images. The combination of these technologies ensures that X-rays and their advancements remain highly relevant and immensely helpful in patient diagnosis and treatment. The C-Arm is exceptionally beneficial and simplifies medical procedures for physicians. With its advanced features, the C-Arm minimizes errors in predicting object locations, diagnosis, and other medical actions. Most impressively, this device can provide live imaging during medical procedures and surgeries involving bones or internal organs. This ensures that surgeries and medical interventions are conducted with ease, accuracy, safety, and comfort.^{4,5}

This case highlights a unique clinical scenario where a metal staple embedded in an adult patient's tongue could not be located despite a previous surgery assisted by MSCT. The object was only successfully removed through a second surgery using C-Arm fluoroscopy, a mobile imaging device capable of real-time visualization during procedures. The novelty of this case lies in demonstrating how intraoperative C-Arm assistance significantly improves the accuracy and efficiency of foreign body removal in soft tissue areas like the tongue, where conventional imaging may fall short.

Although the use of C-Arm fluoroscopy in maxillofacial surgery is uncommon, several reports have

demonstrated its utility in similar contexts. One study successfully employed C-Arm fluoroscopy to extract a three-dimensional foreign object embedded approximately 5 mm deep in the intrinsic tongue musculature near the periosteum.⁵ Another case utilized the device in open reduction and internal fixation of a left subcondylar mandibular fracture.⁶ These findings highlight the versatility and clinical potential of C-Arm technology in enhancing surgical outcomes for complex or otherwise challenging maxillofacial cases.

This report aims to describe the diagnostic and surgical approach undertaken, evaluate the role of C-Arm fluoroscopy in improving intraoperative visualization, and provide insights for the management of comparable cases in clinical practice.

CLINICAL SCENARIO

A 51-year-old male patient presented to the Oral Surgery Department at RSUP Dr. Kariadi Semarang with a chief complaint of a staple lodged in his tongue. The patient was unaware of the staple while eating, which subsequently pierced his tongue, causing pain. The patient had previously undergone surgery with MSCT assistance for foreign body removal performed by an oral surgeon at RSUD Salatiga; however, the staple could not be located. The patient continued to experience pain and had difficulty moving his tongue, which limited him to consuming only soft foods. The patient denied a history of diabetes mellitus, hypertension, and gout. The patient was referred to RSUP Dr. Kariadi Semarang for foreign body removal with a more advanced tool for locating the foreign body (C-Arm imaging).

On clinical examination, the patient was in good general condition and fully conscious (compos mentis). Extraoral assessment revealed symmetrical facial features with no visible signs of asymmetry, edema, or hyperemia. The findings were within normal limits, indicating no outward manifestations of inflammation or infection associated with the foreign body lodged in the tongue.

Intraoral examination revealed an ulcer-like wound on the right lateral tongue region as a result of the prior surgery. Palpation detected a hard, foreign body-like sensation in the right lateral tongue region, accompanied by tenderness, hyperemia, and edema. A prior MSCT scan revealed a well-defined, hyperdense linear lesion measuring 2.27 x 0.27 cm in the right hemilingual region. Its main disadvantage is the absence of real-time visualization during surgical scissors insertion, which is typically available in conventional fluoroscopy guidance systems. Axial imaging showed the lesion to be 2.48 cm from the anterior lingual apex and 0.69 cm from the right lateral tongue edge. Sagittal imaging showed the lesion to be 1.5 cm from the superior lingual margin. A diagnosis of a foreign body in the right



Figure 1. Extraoral examination of the patient.

lateral tongue region was established. The patient was scheduled for corpus alienum removal surgery under general anesthesia with the assistance of C-arm imaging and ultrasound guidance.

Laboratory result one day prior to the surgery showed the patient's glucose ad random level was higher than normal. The patient was referred to an internist and was prescribed 500 mg of metformin that was taken twice, in the morning and evening, the day before surgery. Aseptic preparation was carried out both extraorally and intraorally. The exact position of the foreign body was identified using C-Arm imaging to pinpoint its exact location (Figure 2a). A local vasoconstrictor (2 cc of epinephrine-containing anesthetic, such as Pehacain) was injected along the planned incision line. A mucosal incision was made on the right lateral region of the tongue, followed by blunt dissection using a Metzenbaum scissor to access the embedded object. With the aid of real-time C-Arm evaluation, the foreign body was successfully located and removed (Figure 2b). The surgical wound was then sutured using Vicryl 3.0 absorbable sutures (Figure 2c). The removed foreign body was a needle-like structure with pointed ends, measuring 2.3 cm in length (Figure 2d). Postoperatively, the patient received amoxicillin 500 mg orally every 8 hours and dexamethasone 5 mg by injection every 8 hours. Health education was provided regarding postoperative wound care, soft diet, and oral hygiene to support healing.

PROBLEM FORMULATION

Based on the clinical scenario, a focused clinical question was formulated using the PICO framework to guide evidence-based decision-making (Table 1)

The clinical question formed based on these components is: in patients with foreign bodies embedded in the tongue or head-and-neck soft tissue, does C-Arm assisted surgery, compared to conventional or blind surgical methods, improve localization accuracy and increase the success rate of foreign body removal?

SEARCH STRATEGY AND RESULTS

A systematic literature search was conducted to answer the clinical question using a structured and reproducible approach. The search was performed using electronic databases, including PubMed and ScienceDirect. The keywords used were combinations of "C-Arm Assisted Surgery," "C-Arm fluoroscopy," "foreign body," and "corpus alienum," combined with Boolean operators such as "AND" and "OR." Articles were selected based on predefined inclusion and exclusion criteria. The inclusion criteria comprised studies discussing the use of C-Arm or fluoroscopy in surgical management of foreign bodies, particularly in the head-and-neck or soft tissue regions, including case reports, case series, and clinical studies published in English. Studies were excluded if they were not relevant to the PICO question, did not involve surgical or imaging interventions, or were

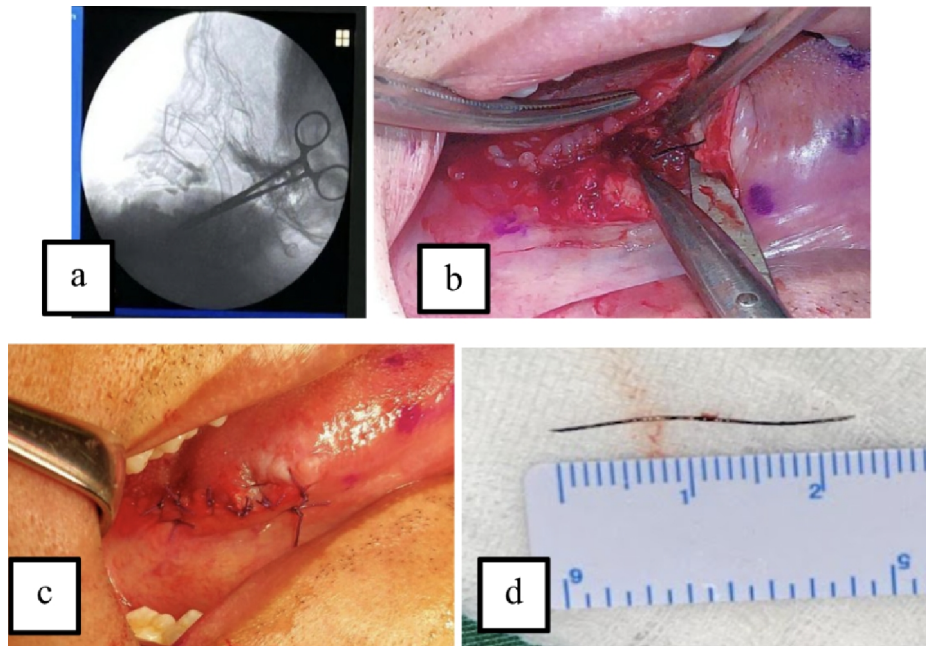


Figure 2. a. C-Arm imaging to confirm; b. Needle-like in tongue before removal; c. The wound was then sutured at the incision site; d. A 2,3 cm long needle with sharp ends on both sides

TABLE 1
PICO framework for guide

Problem	Intervention	Comparison	Outcome
Patients with a foreign body (corpus alienum) in the tongue or head-and-neck soft tissue that is hard to remove with conventional surgery.	C-Arm assisted surgery vs blind surgery	Accurate localization of the foreign body	Successful removal of foreign body

duplicate publications.

After screening, a total of 8 relevant articles were included for further evaluation. Most of the included studies were case reports and small clinical studies, indicating a relatively low to moderate level of evidence. However, the findings consistently supported the use of C-Arm fluoroscopy in improving intraoperative localization and facilitating successful foreign body removal.

The included study consists of an article written by Dong-Yang Ma, *et al.* A critical appraisal of this article is presented in [Table 3](#).

DISCUSSION

A foreign body, or corpus alienum, refers to any object originating from outside the body. When such an object enters the body, it can cause discomfort and unpleasant

symptoms for the patient. In this particular case, the foreign body is a metal needle that has penetrated the tongue. The patient previously underwent a procedure to remove the object at RSUD Salatiga using MSCT, but it was not successfully located. Subsequently, the patient was referred to RSUP Dr. Kariadi with the expectation that the foreign body could be identified and extracted. The patient was then scheduled for surgery under general anesthesia.

The foreign body removal surgery was performed with the assistance of radiological equipment in the form of a C-Arm. It is a radiological device used to view images or objects from a patient, which are directly observed using fluoroscopy with the help of a monitor screen. With this tool, the position of the object or examination subject inside the body can be easily detected, and it can even be viewed live like a video shoot. The advantage of the C-Arm is that it reduces costs because, during the

TABLE 2
Search queries used for literature retrieval in journal databases

Database	Keywords	Hits	Eligible
PubMed	(C-Arm Assisted Surgery)	12	7
Science Direct	AND ((Foreign Body) OR (Corpus Alienum))	84	1

TABLE 3
Critical appraisal of the study

Writers (year)	Dong-Yang Ma, <i>et al.</i> (2024)	
Validity		
1.	Is this case relevant to the population of patients with foreign bodies in the tongue?	Yes. The case involves an adult patient with a staple embedded in the tongue, which could not be removed through a prior blind surgery. It is representative of patients with difficult-to-access foreign bodies in the oral cavity or head-and-neck soft tissues.
2.	Is the C-Arm intervention clearly described and reproducible?	Yes. The procedure is described in detail, including the use of real-time fluoroscopy, patient positioning, and extraction technique under general anesthesia. The standard procedure can be applied in other centers with access to a C-Arm.
3.	Are the reported data objective and consistent?	Yes. Operative outcomes are clearly documented: foreign body location, procedure duration, extraction success, and complications. However, as a single case report, external validity is limited.
Importance		
1.	Does this case support the use of real-time imaging guidance?	Yes. It provides evidence that the C-Arm assists in extracting difficult-to-access foreign bodies, relevant for oral surgery, ENT, and orthopedic practice.
Applicability		
1.	What are the limitations for clinical implementation?	It requires C-Arm facilities and trained medical personnel. As a single case, generalization is limited; larger studies or a case series are needed.

surgery, the patient does not need pre- or post-operative X-rays, as the organ to be operated on can be clearly visualized through the monitor. With the help of the C-Arm, the surgery was successfully completed, and the foreign body was removed from the patient's tongue.^{7,9,10}

In the first surgery, a CT scan was performed; however, its use was still not effective in locating the patient's foreign object. This is because a CT scan can only detect foreign objects outside the operating room, requiring more time as the patient must be moved to the CT machine first, making it less practical and efficient for surgical procedures that require real-time data. In contrast, the C-Arm can be brought directly into the operating room, allowing for more real-time data acquisition. This real-time data enables the surgeon to directly visualize the position of the foreign object during surgery and adjust the surgical approach without having

to pause the procedure. The use of the C-Arm is also more flexible, as it can be positioned at various angles (anterior, lateral, oblique), allowing for visualization of the foreign object from different perspectives without significantly changing the patient's position. Additionally, the radiation dose from the C-Arm is lower than that of a CT scan, allowing it to be used repeatedly if necessary during the surgical procedure.^{11,12}

The staple in the patient's tongue was a 2.3 cm long needle with sharp ends on both sides. The patient was prescribed Amoxicillin 500 mg every 8 hours and Dexamethasone 5 mg every 8 hours. The patient was then instructed to maintain oral hygiene, follow a soft diet, and avoid manipulating the postoperative wound area (e.g., playing with the tongue, sucking on the surgical site, or gargling too hard). The prognosis for this case is good, provided the patient maintains oral hygiene and follows

a high-protein diet to ensure proper tissue healing.

Unlike previous studies that primarily focus on foreign bodies in more accessible areas of the oral cavity, this case involves a rare instance of a metallic foreign object embedded deep within the tongue of an adult patient. Notably, despite the use of MSCT in a prior surgical attempt, the foreign body remained undetected and unretrieved. This report highlights the added value of intraoperative C-Arm fluoroscopy, which enabled real-time visualization and successful removal of the object without the need for repeated exploratory procedures. To our knowledge, documentation of C-Arm utilization in soft tissue foreign body extraction in the tongue remains limited in the literature, making this report a meaningful contribution to clinical practice and imaging-guided surgical techniques.

CONCLUSION

A foreign body in the tongue can cause significant discomfort and functional limitations. In this case, C-Arm fluoroscopy enabled accurate intraoperative localization and successful removal of the object after a previous attempt using MSCT had failed. This case highlights the effectiveness of C-Arm as a real-time imaging tool for managing soft tissue foreign bodies when other imaging modalities are insufficient.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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