

Removal of a Fragment of a Dental Extraction Instrument Using a Magnet: A Clinical Case Report

Mamadou Diatta^{1,2*}, Fatou Alle Fall¹, Khadim Seck¹, Marc Kone², Mouhammad Kane¹, Babacar Tamba^{1,2}

¹Department of Oral Surgery, Institute of Dentistry and Stomatology, Cheikh Anta Diop University, Dakar, Senegal

²Department of Odontostomatology, Idrissa Pouye General Hospital, Dakar, Senegal

Email: *mamadou19.diatta@ucad.edu.sn, *diattamap@hotmail.fr

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Abstract

Introduction: Managing instrument fractures during tooth extraction procedures can sometimes prove complex. The aim of this study is to report the management of a case involving a fracture of an elevator tip embedded in the roof of the mandibular root canal, which occurred during a tooth extraction, using a magnetic method with a magnet. **Clinical Observation:** The patient was a 62-year-old woman referred to the Department of Odontostomatology at the Idrissa Pouye General Hospital in Dakar for the management of a fracture of an elevator tip lodged in the alveolar socket following a tooth extraction. The medical history indicated a fracture of the tip of a right-handed elevator. The intraoral examination had revealed an open, empty alveolar socket at the implant site of tooth 38. To better assess the position of the foreign body and its relationship with the mandibular canal, a cone-beam CT scan was requested. On the axial section, the foreign body, embedded in the roof of the mandibular root canal, was closer to the vestibular bone plate. The treatment plan involved extraction of the foreign body using a magnet via the alveolar socket of tooth 38, which had been slightly enlarged on the vestibular side, following local anaesthesia. The post-operative course was uneventful. **Conclusion:** This technique, which utilises a magnet, is simple and easy to perform, helping to avoid damage to vascular and nerve structures.

Keywords

Tooth Avulsion, Instrument Fractures, Management, Magnet

1. Introduction

Tooth extraction is a common procedure in dental practice [1] [2]. It can be straightforward or complex, requiring adherence to a sequence of steps codified by professional bodies. During tooth extraction, particularly that of mandibular third molars, complications may arise affecting human tissue and/or the equipment used [2] [3]. The management of complications affecting human tissues has been documented in the literature, often with satisfactory results [2] [4]. However, the management of complications affecting the equipment used, such as instrument fractures, poses a challenge for dental surgeons [5] [6]. Indeed, management can sometimes prove difficult and complex due to muscular movements and/or the presence of anatomical obstacles, including the sinus, the mandibular canal and the points of emergence of vascular and nerve structures (foramina) [7] [8].

This treatment may require the use of more expensive methods, such as endoscopically guided techniques, which are often not readily available in many healthcare facilities in relatively low-income countries. In certain situations, such as instrument fractures within the mandibular canal, extraction of the instrument may prove difficult due to the narrowness of the canal within the mandible, which is a dense bone with a thick cortical layer [1] [9]. The aim of this study is to report the management of a case involving a fracture of an elevator tip embedded in the roof of the mandibular root canal, which occurred during a tooth extraction, using a magnetic method with a magnet.

2. Clinical Observation

This case involved a 62-year-old female patient referred to the Department of Odontostomatology at the Idrissa Pouye General Hospital in Dakar by a colleague following a fracture of the tip of a right-handed elevator within the alveolus during the extraction of tooth 38.

The medical history indicated a difficult tooth extraction which had resulted in an intraoperative fracture of the tip of a right-handed elevator, confirmed by a retroalveolar radiograph. The tooth was successfully extracted in its entirety, but the fractured tip of the instrument could not be removed despite several attempts. An orthopantomogram was subsequently performed, confirming the presence of the instrument tip embedded in the roof of the mandibular root canal. This led to the patient being referred to a specialist in oral surgery for more appropriate management. The patient was referred to the specialist on the day the accident occurred. Following a clinical examination, the specialist requested a cone-beam scan, which was carried out the following day, in order to better assess the position of the fragment and plan the appropriate treatment approach. The instrument fragment was removed the day after that using a magnet.

Neurosensory assessment was carried out on the patient's admission, during the clinical interview, and revealed no paraesthesia, tingling or numbness as reported by the patient.

The patient's medical history was unremarkable and her general condition was

good. The patient was taking 1 g of amoxicillin, one tablet every 8 hours, and 1 g of paracetamol, one tablet every 6 hours.

The extraoral examination revealed no abnormalities, with no tenderness on palpation of the left mandibular angle region and normal labio-mentonier sensitivity.

Oral access was unimpeded, with a mouth opening of 40 mm.

The intraoral examination, with teeth clenched and lips and cheeks retracted, revealed no abnormalities. With the mouth open, a gaping, unoccupied alveolar socket was noted at the implantation site of tooth 38, with no suppuration and the mucosa appearing normal around the alveolar wound.

The patient presented for consultation at the department with a retroalveolar X-ray and an orthopantomogram showing the presence of a foreign body (radio-opaque image) in the alveolus of tooth 38, embedded in the roof of the mandibular root canal (**Figure 1**).



Figure 1. Orthopantomogram showing a radiopaque lesion (foreign body) embedded in the roof of the mandibular root canal below the socket of the missing 38.

A cone-beam CT scan was requested in order to better assess the position of the foreign body and its relationship to the mandibular canal, and also to plan the appropriate treatment approach.

On the panoramic view, the foreign body was embedded in the roof of the mandibular root canal (**Figure 2**), with a narrowing of the canal lumen visible on the sagittal section (**Figure 3**).

The axial cone-beam CT scan had revealed that the foreign body was closer to the vestibular bone plate (**Figure 4**).

Following clinical and paraclinical examinations, the definitive diagnosis was a metallic-appearing foreign body embedded in the roof of the left mandibular root canal, close to the outer cortical bone.

The treatment plan was to extract the foreign body using a magnet via the alveolus of tooth 38, with a minimal osteotomy to minimise the risk of damage to the neurovascular bundle within the mandibular canal. The use of a magnet was justified by the fact that the fractured instrument was ferromagnetic.

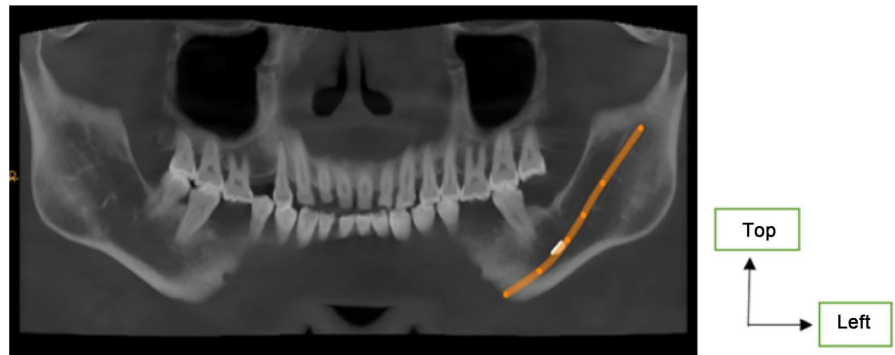


Figure 2. Cone-Beam CT image with panoramic reconstruction showing the foreign body embedded in the roof of the mandibular root canal.

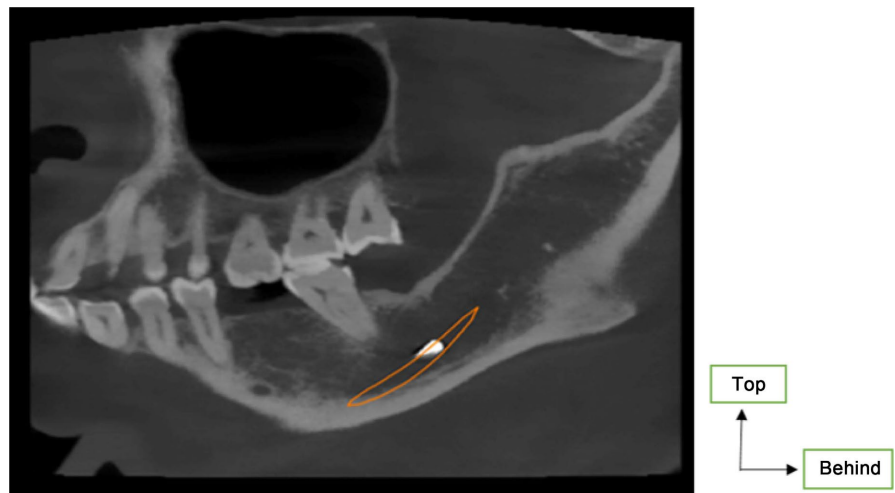


Figure 3. Sagittal cone-beam CT scan showing the foreign body narrowing the lumen of the mandibular canal, with a risk of compression of the neurovascular bundle.

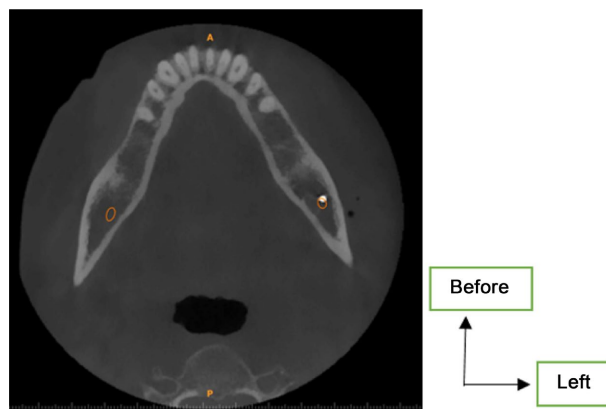


Figure 4. Axial cone-beam CT scan showing the foreign body closer to the outer cortical bone.

The magnet used was the one found in smartphone speakers, which is a neodymium-iron-boron (NdFeB) permanent magnet measuring $10 \times 5 \times 1$ mm with a magnetic field of between 0.3 and 1.2 Tesla (*i.e.* 3000 to 12,000 Gauss).

The surgical protocol involved, once the patient had been positioned and following peri- and intraoral disinfection, the administration of regional anaesthesia via the lingula, followed by supplementary anaesthesia of the buccal nerve. An intra-sulcular incision extending from the mesial aspect of tooth 37 to the retromolar region posterior to the alveolus of tooth 38, combined with a relief incision mesially of tooth 37, was made using a No. 15 blade mounted on a No. 3 scalpel handle. This was followed by the elevation of a full-thickness flap using a Molt elevator and its retraction with a Faraboeuf retractor. Subsequently, the alveolar socket of tooth 38 was thoroughly cleaned and then slightly enlarged on the buccal side using a piezotome. To extract the instrument fragment, the magnet was clamped with needle-holding forceps along almost its entire length to prevent it from being lost in the socket, and inserted into the socket of the extracted tooth after it had been enlarged using a piezotome (**Figure 5(a)**). This enabled the fractured tip of the instrument to be removed through the alveolar socket of tooth 38 by means of magnetic attraction (**Figure 5(b)**). Before use, the magnet was disinfected, cleaned, placed in a sheath and sterilised in a Class B autoclave.

sterilised to reduce the risk of bacterial contamination of the surgical site. The forceps with the magnet and the instrument fragment were completely removed from the alveolar socket of tooth 38 (**Figure 6(a)**) and placed on a gauze pad (**Figure 6(b)**).

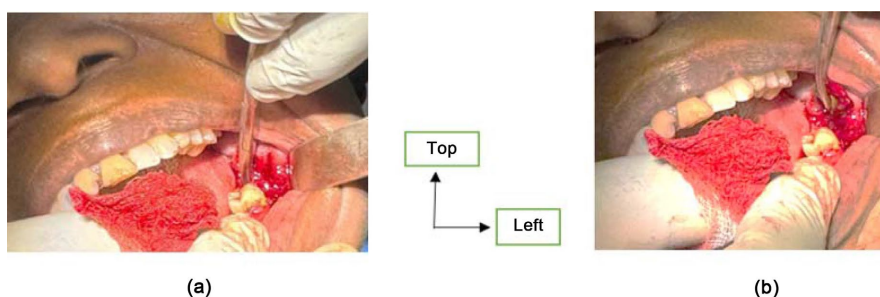


Figure 5. Intraoral images showing the insertion of the needle-holding forceps with a magnet clamped in the socket of tooth 38 (a) and its removal from the socket with the fragment of the instrument attached to the magnet (b).



Figure 6. Image showing the fractured instrument fragment attached to the magnet held by the needle-holding forceps (a) and the fragment detached from the magnet (b).

The site was then rinsed with saline solution before a follow-up X-ray was taken, which confirmed that the instrument fragment had been completely removed (Figure 7).



Figure 7. Follow-up orthopantomogram of the fragment showing the complete removal of the instrument fragment and an empty surgical site.

The surgical site was examined, followed by the placement of separate sutures using 3.0 absorbable suture material (Figure 8). A sterile dressing was applied to the surgical site and held in place by the patient for around ten minutes to ensure haemostasis.

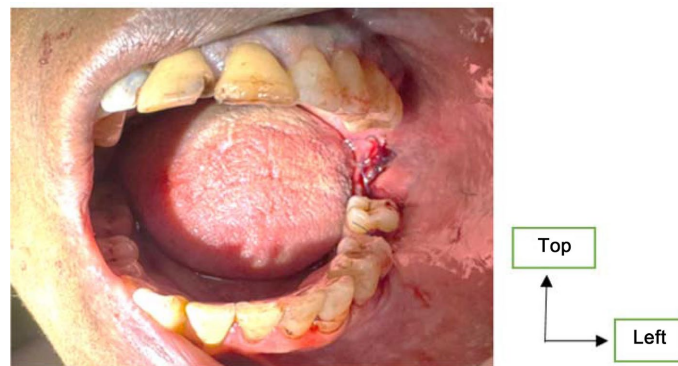


Figure 8. Intraoral view showing the surgical site after sutures have been placed.

The post-operative prescription consisted of 1 g amoxicillin tablets, to be taken as 1 tablet every 8 hours for 7 days, 1 g paracetamol every 6 hours, 20 mg prednisolone tablets at a dose of 1 mg/kg/day (80 mg/day) taken as a single dose in the morning after breakfast for 4 days, and 0.12% chlorhexidine mouthwash, diluted, after meals.

The post-operative check-up at 7 days revealed a burning and tingling sensation suggestive of nerve damage. This led to the prescription of pregabalin 75 mg capsules, to be taken at a dose of one capsule every 8 hours for 10 days. The follow-up at 17 days (D17) noted a favourable outcome with resolution of symptoms, and the sutures were removed (Figure 9).

The post-operative burning and tingling sensations were subjective symptoms reported by the patient. The objective assessment of labio-mentonarian sensory function, on the patient's admission and after the resolution of post-operative neurological symptoms (burning and tingling), involved pinching the mucosal and cutaneous surfaces of the ipsilateral half of the lip with forceps with positive result.

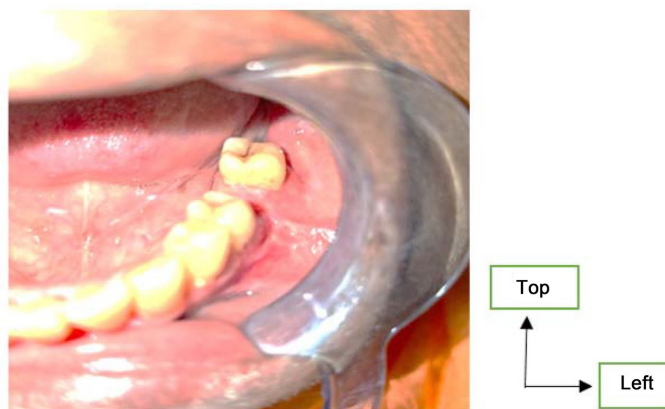


Figure 9. Intraoral view at day 17 showing good healing following the removal of the sutures.

3. Comments

Dental treatment may involve a risk of instrument fractures. This may occur during endodontic treatment [6] [10], periodontal treatment [11] [12] or surgical procedures (tooth extractions) [5] [13]. Instrument fractures during tooth extractions have been reported in the literature [2] [4]. Such incidents can occur in both men and women [11] [14]. The present case involved a woman, as described in the study by Balaji *et al.* [14] in 2013. According to some authors, instrument fractures during tooth extraction have been reported much more frequently in men [7] [11] [13]. This gender difference could be explained by the fact that men have more developed and stronger maxillomandibular bone structures than women [7] [13].

Furthermore, these instrument fractures during tooth extraction may be due, on the one hand, to incorrect manoeuvres when mobilising the tooth and, on the other hand, to the sometimes poor quality of the equipment used. Such instrument fractures can occur in very young patients with mixed dentition [15]. However, they are more commonly reported in adults over the age of 20 with permanent dentition [1] [3] [7] [8]. The present clinical observation concerned an adult in her sixties, in line with the findings of several authors [11] [13] [14]. This could be explained by the fact that, in dental terms, ageing leads to a reduction in the desmodontal space, which can sometimes make tooth extractions difficult.

Several types of instruments can become fractured during tooth extractions [2] [5]. These may include burs [1] [9] [16] or elevator tips [13]-[15]. In the case reported, it was a elevator tip that exhibited ferromagnetic properties.

According to Gentili [2], the clinical signs described by patients vary, ranging from no symptoms at all to nerve-related disorders, including inflammation and trismus. Ali [7] reports no symptoms in his clinical observation. However, Joshi [13] noted pain and Xu [4] noted paraesthesia.

The locations vary, with a predominance in the mandible, particularly in the molar region [1] [2] [7] [9]. These instrument-induced fractures are often reported during the extraction of third molars embedded in an area where the cortical bone is very thick and sometimes difficult to access [3] [16].

As described in this case report, the location may be the site of avulsion of tooth 38 [1] [8] [13] or that of tooth 48, according to some authors [2] [4].

Imaging is essential to better identify the position of the instrument fragment and assess its relationship with neighbouring anatomical structures [1] [8] [9]. This most commonly involves a panoramic radiograph [3] [4] [7] [11] [12], usually supplemented by cone-beam CT [4] [7] [8] [12] [16] to facilitate better surgical planning. In addition, retroalveolar radiography has also been used to assess the position of the broken instrument tip [11] [13].

Furthermore, these fractured instrument fragments may be found in various locations within the mandible. They may be located in the socket of the avulsed tooth [1] [7], within the mandibular canal [4] [9] [16], or within the surrounding soft tissues, such as the floor of the mouth [4] [8]. According to Yaqoob [11], the fractured instrument may also become lodged in the desmodontal space of the adjacent tooth.

Depending on the position of the instrument fragment and the difficulty of accessing the surgical site, treatment will be carried out under local anaesthesia [1] [8] [11] [16] or general anaesthesia [1].

The removal of fractured instrument fragments is usually carried out via a surgical approach involving the elevation of a full-thickness flap, followed by careful exploration of the site, which may sometimes require an osteotomy [3] [7] [13] [16]. This may expose the patient to injury to vital structures such as the inferior alveolar nerve, leading to hypoaesthesia which can impair patients' quality of life [1] [12] [17], or injury to the sinus, leading to sinusitis [17]. According to Matsuda [1], the use of ultrasound-guided surgery facilitates the removal of the fractured instrument tip. In the present case report, a magnet was used to extract the fractured instrument fragment following careful enlargement of the socket of the avulsed tooth. Indeed, the risks of paraesthesia due to progressive nerve compression, secondary migration of the fragment, and secondary infection resulting from a reaction to the presence of a foreign body had also motivated this decision. This technique was used by Xu *et al.* [4] in 2025, who, in his case series, had used a magnet to extract fractured instrument fragments during tooth extraction in more than 53 per cent of patients. The use of a magnet to extract fragments of instruments that have fractured during tooth extraction helps to minimise the risks of vascular and nerve damage, as well as damage to the adjacent tooth and surrounding tissues.

A post-operative follow-up X-ray is essential to confirm that the instrument fragment has been completely removed [1] [4].

Furthermore, the most commonly reported post-operative complication in the literature is hypoaesthesia resulting from trauma to the inferior alveolar nerve [3] [4]. Indeed, transient post-operative sensory symptoms noted in this case report could be explained by the magnetic pull of the instrument fragment, and the short follow-up period (17 days) limits any causal inference.

4. Conclusion

Instrument fractures are complications that can occur during tooth extractions. Managing them can prove difficult due to the narrowness of the dental sockets and the depth at which they occur. Several therapeutic approaches have been used, ranging from non-guided surgical removal to ultrasound-guided surgery. The technique using a magnet is simple and straightforward, allowing the extraction of ferromagnetic instrument fragments embedded in the roof of the mandibular root canal whilst minimising bone removal during osteotomy through minimally invasive surgery. Post-operative outcomes were good at 17 days, although monitoring was required for several months.

Informed Consent

The patient had been informed that her case would be published in order to share our experience with other colleagues. She gave her consent and agreed to the publication of the paper.

Data Availability Statement

The Data used to support the finding of the study are included in the manuscript and are available upon reasonable request from the corresponding author.

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We would like to thank the patient for agreeing to the publication of this work. All authors have viewed and agreed to the submission.

Author Contributions

Conceptualization, Mamadou Diatta and Fatou Allé Fall; methodology, Khadim Seck; validation, Mamadou Diatta, Fatou Allé Fall, and Khadim Seck; formal analysis; investigation, Marc Koné; resources, Fatou Allé Fall; data curation, Mouhammad Kane; writing—original draft preparation, Fatou Allé Fall; writing—review and editing, Mamadou Diatta; visualization, Babacar Tamba; supervision, Babacar Tamba. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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