

Letter to the Editor

Dental implant misplacement into the anterior cranial fossae: a unique case and review of literature**1. Introduction**

The complications of implant surgery are bleeding, infection, sinusitis, and implant migration or misplacement [1–5]. Implant migration may occur either during the procedure or in the following times after the surgery [2]. During surgery, misplacement typically arises from insufficient surgical experience, inadequate primary stabilization during implantation, and the limited ability of thin bone structures to resist and prevent such displacement [1,3]. Maxillary sinus is the most common migration and misplacement site due to its anatomical proximity. Subsequently, these may extend to the ethmoid and sphenoid sinuses and intraconal region [1,3,5,6]. Notably, misplacement of the dental implant into the anterior cranial fossa is an extremely rare occasion, to our best knowledge, with only one documented case in the existing literature [7]. The recommended treatment is immediate removal of the implant [3,4,7]. Here, we aimed to present this exceptional case via a video presentation to facilitate its effective management in the field of neurosurgical practice.

2. Case presentation

A 38-year-old male applied to the dental clinic for dental implant surgery. The surgeon performed a closed sinus elevation to the maxillary molar area during the dental implant operation. On insertion, primary stabilization was insufficient, and the surgeon used force on the hand driver. So the maxillary sinus floor was perforated, and the dental implant advanced through the sinus cavity. The patient presented us with dental implant misplacement. His neurological examination revealed stable level of consciousness, lateral movement limitation, and painful eye movements. The patient did not experience any visual loss or diplopia but he had periorbital ecchymosis and proptosis. Vital signs were normal. Upon admission, the patient's laboratory studies were completely normal. Plain radiography and computed tomographic (CT) scans were performed, showing that the implant had misplaced entirely into the left anterior cranial fossa (Fig. 1A–G). The implant material was found to be damaged within the frontal lobe, resulting from its penetration through the orbital roof by advancing transmaxillary and transorbital and causing a contusion around this region. Optical coherence tomography was performed and it was normal. (Fig. 1H). The patient was hospitalized, and prophylactic antibiotic therapy was started for meningitis (with ceftriaxone 2 × 2 gr, intravenous (i.v.), metronidazole 3 × 500 mg, i.v. and vancomycin 2 × 1 gr, i.v.). The patient was operated on with a left-sided eyebrow incision and the misplaced implant material was removed without complications (Fig. 1I). A detailed surgical

technique is shown in supplemental data. Postoperative early non-contrast cranial CT (Fig. 2A) and contrast-enhanced cranial magnetic resonance imaging (MRI) were performed, and no obvious complications were observed. Mild edema findings, circular contrast enhancement, and a non-diffusion-restricting area were detected around the perilesional contusion area (Fig. 2B–F). The postoperative course was eventless and the patient was discharged two weeks later. At the three-month follow-up, the optic globe was completely healed and he showed no signs of cerebrospinal fluid (CSF) fistula.

3. Discussion

The most commonly reported complications of dental implant surgery are local wound infections, bleeding, paresthesias due to nerve damage, and less frequent implant migrations [1,3]. Implant migrations can be seen perioperatively as well as in the following weeks and months postoperatively [3]. The most common migration is towards the maxillary sinus due to its surgical proximity [3,4]. This is followed by the ethmoid and sphenoid sinuses [1,4]. In our case, misplacement, which is an unintentional complication resulting from surgery, is the issue rather than migration.

Accidents, self-harm, or iatrogenic incidents can all result in intracranial foreign bodies [7]. Misplacement of a dental implant in the anterior cranial fossa is an extremely rare complication. Increased pneumatization in the maxillary sinus, thin residual alveolar bone structure, placement of implant material after sinus elevation, decrease in residual alveolar bone height after sinus elevation (minimum height to be <4 mm) are the main reasons that may result in failure implant placement [1]. In such a case, there is no serious barrier to the thrust force that will occur toward the anterior cranial fossa. In our case, it was observed that the implant was unintentional, uncontrolled application of force placed in the frontal skull base during the surgery.

Surgical removal of anterior cranial fossa foreign bodies is recommended to prevent CSF fistula and infection. This surgery can be done endoscopically or by craniotomy [7,8]. In the case previously reported, the foreign body was removed by endoscopic transnasal approach, and CSF fistula treatment was provided with the use of artificial dura material [7]. In our case, the implant material was indented to the skull base via transmaxillary and transorbital routes. We preferred the transorbital approach with an eyebrow incision, which does not require a craniotomy and has a much easier possibility of repairing the skull base. The implant material was removed with gentle manipulations. The defect in the frontal sinus and orbital roof was repaired by reconstructing the broken bone fragments and using a fat graft taken from the

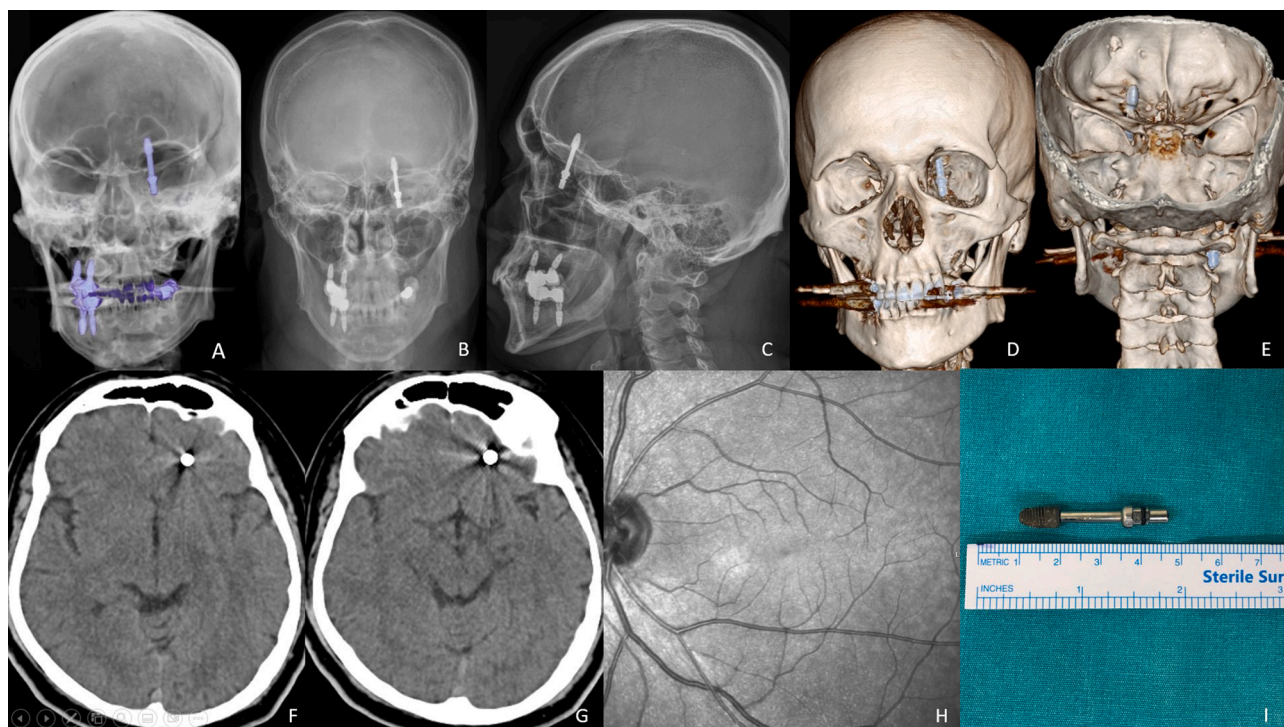


Fig. 1. Preoperative anteroposterior (A, B) and lateral radiography (C); non-contrast cranial CT three-dimensional reconstruction anterior (D) and posterior (E) view images; preoperative non-contrast cranial CT axial images (F,G) of the patient show misplaced material in the frontobasal area. Preoperative optical coherence tomography result (H) of the patient were normal and no retinal damage or macular edema was detected. Intra-operative photograph (I) showing the misplaced implant material.

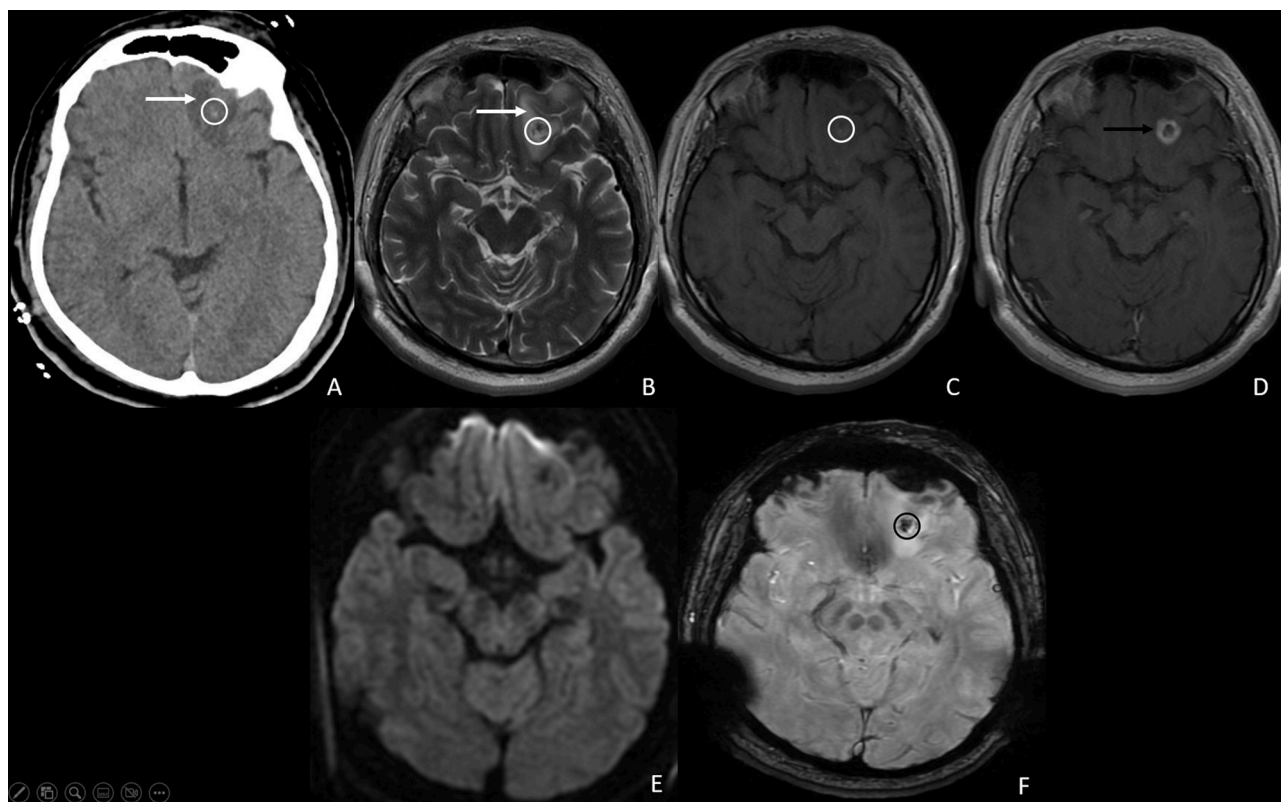


Fig. 2. In the postoperative uncontrasted cranial CT axial sections of the patient (A), the left frontal millimetric contusion area (white circle) and perilesional edema around it (white arrow); contrast-enhanced cranial MR images likewise in T2 sequence axial image (B) frontal contusion (white circle) and perilesional edema (white arrow); circular contrast enhancement (black arrow) and frontal contusion area (white circle) on T1 non-contrast axial (C) and T1 contrast axial images (D); this lesion shows no diffusion restriction on diffusion-weighted axial sections (E) and microhemorrhages (black circle) on SWAIN sequence imaging (F).

leg.

4. Conclusion

Frontobasal misplacement after dental implant surgery is a very rare complication and can be effectively and safely managed with careful planning. In such cases, we recommend immediate removal of the implant material as it is essential to prevent complications such as CSF fistula, meningitis, and epilepsy. While endoscopic removal is currently the preferred surgical approach, transcranial and transorbital (with an eyebrow incision) microsurgical methods remain alternative strategies that can be performed.

Physicians performing implant treatment must have a detailed understanding of the anatomy of the maxillofacial region. Preoperatively, the mineralization of the area where the implant will be placed in the patient's maxillary alveolar area and the thickness of the residual alveolar area should be measured. It should be remembered that after passing this area, the skull base can be reached without a severe barrier, and undesirable complications may develop. To better learn the anatomy of this region, physicians who will perform implant surgery should practice and gain experience by attending cadaveric courses. Such undesirable complications can be minimized with surgeries performed by experienced implantologists.

Conflict of interest

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Human and animal rights

The authors declare that the work described has not involved experimentation on humans or animals.

Consent for publication

Consent of all authors.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.neuchi.2024.101533>.

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