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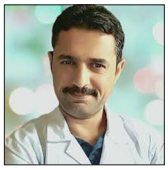
Case Report

Drill bit breakage with tip dislodgment deep into the brain parenchyma: A unique craniotomy complicatıon

Mohammed Aladdam, Mehmet Ali Kahraman, Muhammed Emin Aksu, Mehmet Sabri Gürbüz

Department of Neurosurgery, Istanbul Medeniyet University, Göztepe Prof. Dr. Süleyman Yalçın City Hospital, İstanbul, Türkiye.

E-mail: Mohammed Aladdam- muh.adam.93@gmail.com; Mehmet Ali Kahraman- m.alikahraman1795@gmail.com; Muhammed Emin Aksu- m.eminaksu@outlook.com; *Mehmet Sabri Gürbüz- mehmetsabrigurbuz@gmail.com



***Corresponding author:**
Mehmet Sabri Gürbüz, Department of Neurosurgery, Istanbul Medeniyet University, Göztepe Prof. Dr. Süleyman Yalçın City Hospital, İstanbul, Türkiye.

mehmetsabrigurbuz@gmail.com

Received: 27 April 2025
Accepted: 08 July 2025
Published: 08 August 2025

DOI
10.25259/SNI_416_2025

Quick Response Code:

ABSTRACT

Background: Breakage of the drill bit during craniotomies is quite common; however, penetration of the dura and leptomeningeal layers and dislodging of the broken fragment into the brain parenchyma have not been previously reported.

Case Description: This case report demonstrates a unique and challenging complication in neurosurgery involving a 57-year-old male patient who presented with a large hypertensive intracerebral hemorrhage in the right hemisphere, and intractable intracranial hypertension was taken to the operating room to perform a right decompressive craniectomy and evacuation of intraparenchymal hematoma. During the craniotomy using a disposable, footed B1 drill bit, the drill bit broke and was not found during the surgery. Following the surgical procedure, the routine postoperative computed tomography scan revealed a dislodged drill bit fragment deeply embedded within the frontal lobe parenchyma. The patient was taken again to the operating room. Under fluoroscopy guidance, the drill bit was extracted successfully.

Conclusion: We present this unique case as it can be encountered in daily neurosurgical practice and present our recommendations for management and prevention of such a rare complication, which can be helpful to other neurosurgeons.

Keywords: Complication, Craniotomy, Drill bit breakage

INTRODUCTION

In the past few decades, electrical drills have become an indispensable tool, especially in neurosurgical and orthopedic procedures. They are considered essential tools to allow for rapid and safe access to neurovascular structures in different cranial and spinal procedures and in different fixation procedures in orthopedic surgery.

The incidence of drill bit breakage, subsequent dislodgment, and embedding within deeper tissues is notably high in orthopedic surgery.[1] The rate of instrument breakage during orthopedic procedures has been estimated in one series to range from 0.35% to 18%.[3] In our comprehensive review of the neurosurgical literature, we could not locate considerable research detailing the incidence of such complications.

This study presents a case report involving a 57-year-old patient who suffered a drill bit fracture during surgery for hypertensive intraparenchymal hematoma, resulting in the drill bit breakage and penetration of the brain parenchyma.

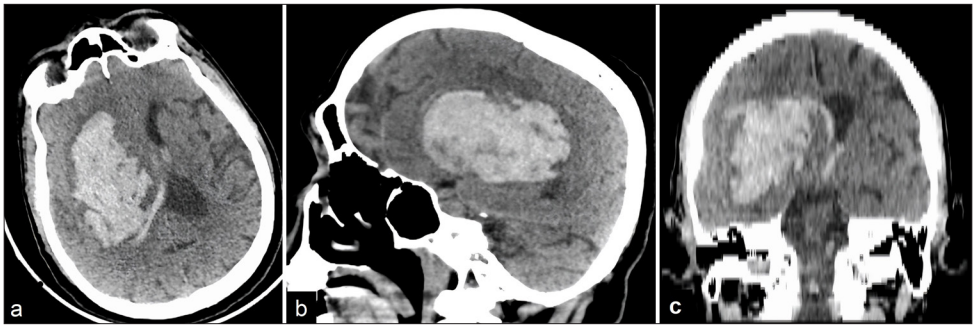


Figure 1: Preoperative (a) axial, (b) sagittal, and (c) coronal cranial computed tomography images. An intraparenchymal hemorrhage is present in the right hemisphere, involving the ventricle and causing a considerable midline shift.

We expect that reporting this unusual complication will increase neurosurgeons' awareness of its potential occurrence and preventative strategies.

CASE DESCRIPTION

A 57-year-old man with a prior cerebrovascular accident, on warfarin and clopidogrel, was admitted to our emergency department because of the acute onset of left-sided weakness and speech difficulties. The patient's cranial computed tomography (CT) scan revealed a large intracerebral hematoma in the right hemisphere, suggestive of a hypertensive etiology, and a considerable midline shift toward the left hemisphere [Figure 1]. The patient was immediately transported to the operating room for a right decompressive craniectomy and evacuation of the intraparenchymal hematoma. During the surgery, the Medtronic Midas Rex® Legend® (Jersey City, New Jersey, United States) electric-powered drill system was utilized for the craniotomy; a disposable, 1.5 mm tapered drill bit (B1 drill bit) with a footed attachment was used to cut the bone flap. During performing the craniotomy using the footed attachment, a breakage of the drill bit occurred and was nowhere to be found intraoperatively. After completing the surgery, a routine follow-up CT scan was acquired. CT scan revealed the broken tip of the drill bit dislodged deeply into the frontal lobe parenchyma [Figure 2].

To prevent the risk of infection and migration of the metallic fragment, the patient underwent a second operation to extract the fragment embedded in the brain parenchyma. The entry point of the broken fragment inside the brain could not be identified. With fluoroscopic guidance, the drill bit has been successfully located and found through a small corticotomy using a surgical microscope [Figure 3]. The broken drill bit fragment was retrieved using a microforceps [Figure 4].

DISCUSSION

Complication in neurosurgery, such as dural laceration, major venous sinus injury, and/or cortical contusions, can

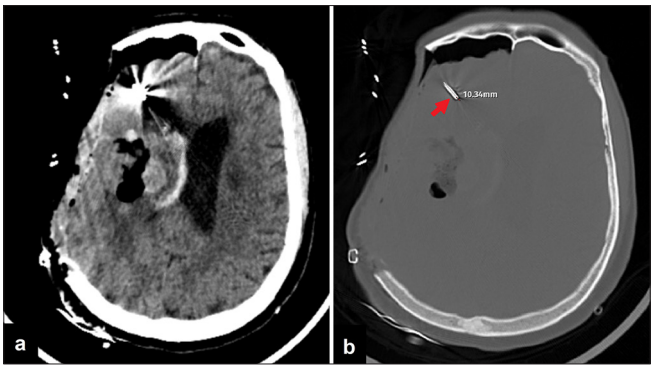


Figure 2: Postoperative axial (a) brain and (b) bone window cranial computed tomography images of the patient. A broken drill bit embedded in the parenchyma is seen in the right frontal lobe, below the craniectomy margin. In image b, the broken drill bit is indicated by the red arrow.

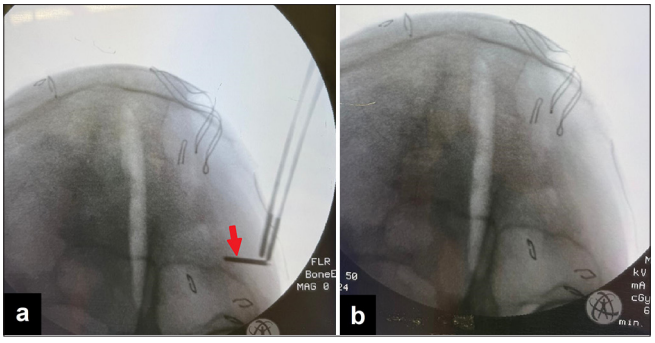


Figure 3: Intraoperative anteroposterior fluoroscopy images of the patient. (a) The broken drill bit, highlighted by the red arrow, is identified, and its position is ascertained using microforceps, (b) Image after removing the drill bit.

be encountered during craniotomy and burr hole placement. When we searched the neurosurgical literature, even though the B1 electrical drill bit can break during the craniotomy, we have not encountered any case of dislodgment of drill bit fragments into the brain parenchyma. It is a neurosurgical complication that may be encountered very rarely owing to the routine footplate use and the protective role of the dura. Most of these complications can be avoided or mitigated by

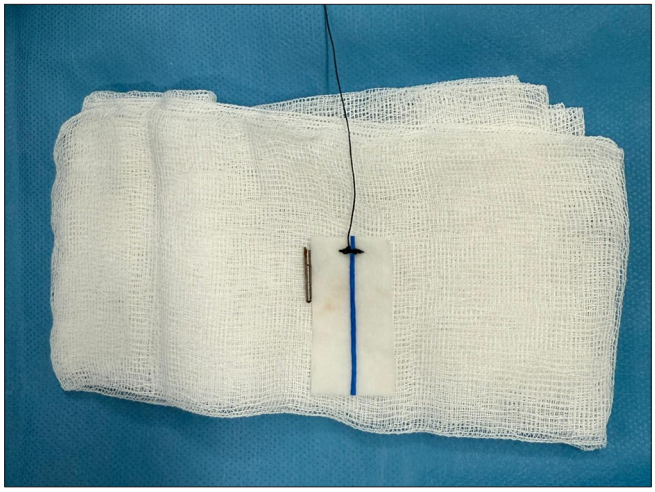


Figure 4: A comparison of drill bit size and cottonoid dimensions is presented.

the meticulous handling of the drill bit, adequate dissection of the dura mater from bone within the burr hole.

Penetrating brain injury caused by drill bit breakage has been reported only once in the literature, and in that case, the drill used was a high-speed air drill.[2]

The present case is unique in the neurosurgical literature in that this complication occurred while using an electric drill system equipped with a protective footplate and projectile-like penetration of the brain parenchyma. Despite its rarity, this complication presents a significant challenge in neurosurgery and carries the potential for catastrophic outcomes; therefore, preventative measures are crucial.

This complication may have resulted from excessive force applied to the drill shaft, and possibly, the weakened structural integrity of the bit which might be related to its repetitive resterilization and use coupled with the compromised integrity of the dura mater.

In our view, this complication serves as a reminder of the importance of careful consideration of several factors:

1. The need for regular periodic equipment maintenance
2. Appropriate selection of drill bits and attachments
3. Avoiding excessive force or torque during the operation of this equipment
4. We recommend against the re-sterilization and reuse of drill bits intended for single-use only
5. In the event of a drill bit breakage during surgery, we strongly suggest the acquisition of intraoperative radiographic images if the broken fragment cannot be found for localization of any fragment that might have migrated into the brain tissue and to achieve timely removal and hemostasis.

Retrieving the drill bit fragment from the brain parenchyma required meticulous microsurgical dissection to minimize further injury to the neurovascular structures.

CONCLUSION

This report highlights a unique and serious complication in neurosurgery, aiming to contribute to awareness and provide recommendations regarding immediate management strategies and possible considerations that might help minimize such occurrences.

Ethical approval: Institutional review board approval is not required.
Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent.
Financial support and sponsorship: Nil.
Conflicts of interest: There are no conflicts of interest.
Use of artificial intelligence (AI)-assisted technology for manuscript preparation: The authors confirm that there was no use of artificial ıntelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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How to cite this article: Aladdam M, Kahraman MA, Aksu ME, Gürbüz MS. Drill bit breakage with tip dislodgment deep into the brain parenchyma: A unique craniotomy complicatıon. Surg Neurol Int. 2025;16:333. doi: 10.25259/SNI_416_2025