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Case Report

Chronic Subdural Hematoma Formation after DBS Surgery: A Case Report

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BACKGROUND: Chronic subdural hematoma is one of the most common neurosurgical pathologies. The pathophysiology of chronic subdural hematoma may be based on traumatic damage to the dura mater and associated inflammatory processes. Deep brain stimulation (DBS) surgery is an invasive method for treating Parkinson's disease. It is performed by opening a burr hole followed by stereotactic placement of electrodes through an incision in the dura mater. Therefore, this surgery may be one of the iatrogenic causes of chronic subdural hematoma.

CASE PRESENTATION: We present an uncommon case of chronic subdural hematoma (CSDH) formation and subsequent evacuation after deep brain stimulation (DBS) surgery. A 69-year-old male with Parkinson's disease had a DBS placement and three months later he developed right-sided motor weakness for two days. A computed tomography (CT) scan revealed a 3 cm left-sided cSDH, which was evacuated emergently. The patient had marked improvement in motor function postoperatively and was discharged after three days.

CONCLUSION: While DBS remains a valuable treatment modality, its invasive nature may cause hemorrhagic complications and there should be a low threshold for neuroimaging for patients with new neurological symptoms.

KEYWORDS: Deep brain stimulation, Parkinson's, Subdural hematoma.

INTRODUCTION

Chronic subdural hematoma has a higher incidence in the geriatric population and is one of the most common neurosurgical pathologies.[1] Despite this, its pathophysiology is not clearly understood. While historically associated with trauma, it is now clear that more complex mechanisms, including neoangiogenesis and inflammatory processes, may be underway.[2]

Deep brain stimulation surgery is a revolutionary technique that changed the treatment of cases with refractory Parkinson's disease.[3] It is achieved by stereotactic placement of electrodes to the deep brain nuclei using a burr hole in the skull.

To our knowledge, CSDH is an uncommon entity that has been only reported in 17 cases in the literature.[4-6] We present a case that was admitted with right-sided hemiparesis due to chronic subdural hematoma three months after DBS surgery.

CASE PRESENTATION

A 69-year-old male with the diagnosis of Parkinson's disease for the last ten years had a DBS placement three months ago. He was admitted to the emergency department due to right-sided motor weakness for two days. He had no headache, nausea, or vomiting and on examination, the patient had a Glasgow coma scale of 15 and 4/5 hemiparesis on the right side. A computed tomography (CT) scan revealed a 3 cm left-sided chronic subdural hematoma with an 8 mm midline shift **(Fig. 1)**. There was no history of trauma or antiplatelet/anticoagulant usage.

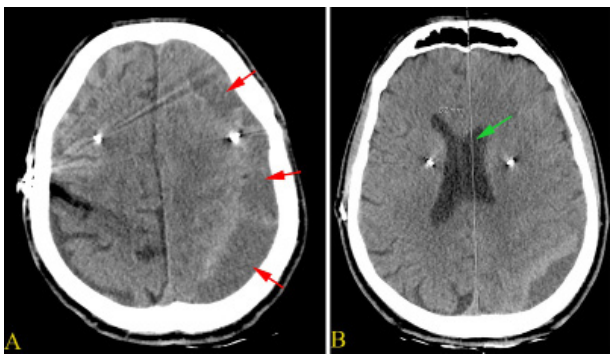

Fig 1: (A) Preoperative CT showing the hypodense chronic subdural hematoma with hyperdense areas, marked by red arrows. (B) Preoperative CT showing 8.2 mm midline shift, marked by the green arrow.

The patient underwent urgent left-sided double burr-hole drainage of the subdural hematoma under local anesthesia and placement of a Penrose drain. The DBS leads were preserved using careful dissection and placement of the burr-hole **(Fig. 2).** Postoperative testing revealed no damage to the electrodes.

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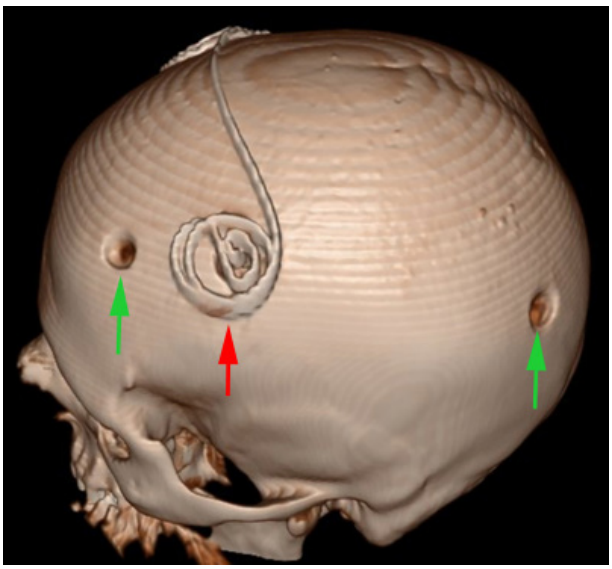

Fig 2: 3D reconstruction of the postoperative CT image. Burr holes used to evacuate the hematoma are marked with green arrows, while the lead is marked by a red arrow.

A postoperative CT scan **(Fig. 3)** revealed successful evacuation of the subdural hematoma. The patient had marked improvement in motor strength. Penrose drains were removed after two days, and the patient was discharged.

Fig 3: Postoperative CT image. Note the hematoma cavity is filled with air, marked with a red arrow.

Ethics Approval: This is a retrospective observational case study. The Ege University Research Ethics Committee has confirmed that no ethical approval is required.

Consent to Participate: Informed consent for surgery was obtained from the patient included in the study. Consent to participate is not applicable as this is not an experimental study.

Consent for Publication: The participant has consented to the submission of the case report to the journal.

DISCUSSION

Deep brain stimulation (DBS) is an invasive yet established therapeutic modality for neurological and neuropsychiatric disorders.[3] While it is an effective technique for managing these diseases, the procedure's invasive nature may cause several complications, including subdural hematoma (SDH).[4]

Several case reports have reported cases of CSDH in patients who underwent DBS implantation with courses that varied in severity, ranging from asymptomatic to life-threatening. The SDH incidence rates following DBS surgery vary widely, ranging from 1% to 6%.[4,5] It should be noted that the true incidence may be higher, as some asymptomatic or mild cases may go unnoticed.

The pathophysiological mechanisms leading to SDH after surgery remain poorly understood, but several hypotheses have been proposed. Surgical insertion of the DBS electrode may cause minor trauma to the brain vasculature or dura mater, potentially leading to hemorrhage and hematoma formation. DBS electrodes may exert pressure on the surrounding brain tissue or vasculature, potentially causing microvascular injury over time, which may contribute to the development of SDH. Also, anticoagulants or antiplatelet medications may increase the risk of hemorrhagic complications.[4,6]

The SDH following DBS surgery can lead to various consequences, including neurological deficits, increased morbidity, and prolonged hospital stays.[4] Risk factors such as advanced age or a history of coagulopathy may predispose patients to a higher likelihood of developing SDH. While these factors are not treatable, we should be aware of possible complications and extend our follow-up period accordingly.

The most common and severe complication of DBS is intracerebral hemorrhage, which was shown to have a prevalence of 2.9% in a recent meta-analysis by Cheyuo et al.showing the location of the hemorrhage to be 16% at the entry point, 31% along the length of the lead and 7% at the target. Sixty percent of these were detected at 24 hours postoperatively while 49.6% of them were symptomatic.[7]

We have not found any cases of epidural hematomas in the literature, which might be due to the rarity of the entity, or it might be possible that it presents along other types of intracerebral hemorrhages and thus may be underreported or underdiagnosed.

The underlying vascular pathologies may also contribute to potential complications and may cause catastrophic bleeding that requires urgent evacuation. Fukaya et al. reported one such case of an arteriovenous malformation bleed along the insertion track.[8] Vigilance for any vascular malformations that might be diagnosed from the preoperative scans is necessary for preventing such disasters.

CONCLUSION

While DBS remains a valuable therapeutic option for patients with neurological and neuropsychiatric disorders, it is an invasive procedure that may cause hemorrhagic complications. There should be a low threshold for neuroimaging for patients with neurological symptoms as symptoms may be misconstrued as symptoms of the primary disorder and early diagnosis of SDH may allow for timely intervention. Treatment strategies can range from conservative management (e.g., discontinuing anticoagulants) to surgical evacuation in symptomatic or severe cases.

List of Abbreviations

CSDH : Chronic subdural hematoma.
CT: Computed tomography.
DBS: Deep brain stimulation.
SDH: Subdural hematoma.

Disclosure

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