Case Report

Subarachnoid Hemorrhage and Internal Carotid Artery Dissection and Occlusion Following Self-Enucleation

Abstract
Self-enucleation is an uncommon type of major self-injury, which may lead to severe neurological deficits and life-threatening complications, such as subarachnoid hemorrhage (SAH) and internal carotid artery (ICA) dissection and occlusion. Our patient is a 53-year-old man with a history of bipolar disorder and schizophrenia who presented with SAH, intraventricular hemorrhage, ICA dissection and occlusion, and right cerebral infarct following self-enucleation. Despite a Glasgow Coma Score of 6 on initial presentation, he improved with conservative management. He achieved a near-complete neurological recovery, with residual left lower extremity weakness and mild confusion. Self-enucleation is a major neurologic, ophthalmologic, and psychiatric emergency with a potential for serious neurological complications and contralateral visual loss. Yet, conservative management may lead to dramatic recovery.

Keywords: Dissection, internal carotid artery, occlusion, self-enucleation, subarachnoid hemorrhage

Introduction
Self-enucleation, also known as auto-enucleation or oedipism, is an uncommon type of self-mutilation that is classified as a major self-injury.\(^1\)\(^2\) It is more common in men than in women\(^3\)\(^4\)\(^6\) and is overwhelmingly associated with acute psychosis due to untreated psychiatric illnesses or drug use.\(^1\)\(^4\)\(^6\)\(^7\)\(^9\) Self-enucleation involves avulsion of the extraocular muscles, optic nerve, and ophthalmic artery (OA), which may lead to devastating neurovascular complications. These include contralateral visual field deficits due to optic chiasm injury, subarachnoid hemorrhage (SAH), cerebrospinal fluid leak, infection, and internal carotid artery (ICA) dissection.\(^4\)

Only 10 cases of traumatic SAH due to OA avulsion have been reported in the literature,\(^4\)\(^7\)\(^9\) five of which were reported to be associated with diffuse hemorrhage in the basal cisterns, mimicking the pattern seen in aneurysmal SAH. Given the risk of cerebral vasospasm following SAH, which may lead to ischemic infarcts, these patients require careful monitoring in an intensive care unit.\(^5\) To the best of our knowledge, only one case of ICA dissection after self-enucleation has previously been reported in the literature.\(^4\) We present a unique case of self-enucleation with both SAH as well as ICA dissection and occlusion.

Case Report
The patient is a 53-year-old male with a history of bipolar disorder, schizophrenia, and multiple suicidal attempts who electively stopped his psychiatric medications at 1 month prior to presentation. During an acute psychotic episode, the patient self-enucleated his right eye. He arrived unconscious at the emergency department (ED), and he was intubated. The empty right orbit was washed out and packed with iodoform gauze in the ED, and the patient was then transferred to our facility. Neurological examination revealed a Glasgow Coma Score (GCS) of 6, withdrawal in all extremities except left upper extremity, and positive left corneal, cough, and gag reflexes. Computed tomography (CT) images showed extensive SAH (Fisher grade 4), as well as intraventricular hemorrhage and acute hydrocephalus [Figure 1]. CT

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angiography and digital subtraction angiography (DSA) revealed occlusion of the right ICA [Figure 2]. The gauze in the right orbit was gently removed with irrigation and no bleeding was encountered. A plastic conformer was placed inside the eyelids to maintain the socket space and allow the socket to granulate in, and antibiotic eye ointment was applied to prevent infection.

Per discussion with the family, the patient was initially managed conservatively in the neurointensive care unit. His GCS, however, improved, and he was extubated on posttrauma day (PTD) 2, with a GCS of 13. Mental status then declined overnight. An external ventricular drain (EVD) was placed, revealing an elevated opening pressure of 30 cmH2O, and resulted in immediate improvement. Neurological examination showed a reactive left pupil and full motor strength in all extremities, except for weakness in the left distal lower extremity that persisted throughout the hospital stay. Magnetic resonance imaging (MRI) demonstrated acute ischemia in the right distal anterior cerebral artery (ACA) and middle cerebral artery (MCA) territories [Figure 3]. Repeat cerebral angiogram confirmed complete occlusion of the right cervical ICA (C1–C7 segments) with robust cross-filling of the right MCA from the anterior communicating and posterior communicating arteries [Figure 4]. Daily transcranial Doppler (TCD) readings showed elevated flow velocities in bilateral ACAs and MCAs. The patient failed multiple EVD clamping trials and had persistent hydrocephalus, necessitating placement of a ventriculoperitoneal shunt. Head CT on PTD 28 showed a hypodensity within the right supplementary motor area [Figure 5], consistent with subacute ischemia seen on prior MRI studies and likely the cause of persistent left lower extremity weakness. During a psychiatric evaluation, the patient attributed his self-enucleation act to command auditory hallucinations and was transferred to an inpatient psychiatric unit for continuing care. At discharge, the patient was alert but confused with a GCS of 14. Motor strength was 4+/5 in the right hemibody, 4/5 in the left upper extremity, and 2/5 proximally, and 0/5 distally in the left lower extremity. The patient was given instructions to follow-up for orbital reconstruction with dermis fat graft.

Figure 1: (a) Axial computed tomography head image showing acute diffuse subarachnoid hemorrhage in the frontotemporoparietal and basilar cisterns. (b) Axial computed tomography head images more superiorly showing intraventricular hemorrhage in the 3rd ventricle

Figure 2: (a) Coronal computed tomography angiography image demonstrating occlusion of the right internal carotid artery just distal to the bifurcation of the right common carotid artery. (b) Coronal three-dimensional reconstruction of the computed tomography angiography image in Figure 2a. (c) Lateral digital subtraction angiography with injection into right common carotid artery demonstrating occlusion of the right internal carotid artery near the bifurcation of the right carotid bifurcation

Figure 3: Axial diffusion-weighted imaging image showing a hyperdensity in the right supplementary motor area, indicating an ischemic infarct

Figure 4: Coronal digital subtraction angiography image with injection into the left internal carotid artery demonstrating filling of the right anterior cerebral and middle cerebral arteries through the anterior communicating artery
| Reference (date) | Age | Sex | Laterality | Psychiatric or substance abuse history | Method of self-enucleation | Neurological sequelae | Interventions required for neurological sequelae |
|------------------|-----|-----|------------|----------------------------------------|---------------------------|----------------------|-----------------------------------------------|
| Brown (1972)[10] | 24  | Male| Left       | LSD-induced schizophrenic reaction     | Own fingers               | Contralateral hemianopsia due to optic chiasm damage | None                                           |
| Coussa et al. (2018)[11] | 50s | Male| Right      | Cocaine                                | Metallic object           | SAH; IVH in lateral, third and fourth ventricles; stroke secondary to vasospasm; cognitive impairment | None                                           |
| Dilly and Imes (2001)[12] | 54  | Male| Left       | Paranoid schizophrenia; recent discontinuation of medications | Own fingers               | Contralateral hemianopsia due to optic chiasm damage | None                                           |
| Eisenhauer (1985)[13] | 33  | Female| Right       | Schizophrenia                           | Unknown                   | Left hemiparesis; aneurysm of ICA at take-off of OA | Surgical clipping of aneurysm                  |
| Gauger et al. (2015)[4] | 37  | Male| Left       | Schizophrenia; recent discontinuation of medications | Own fingers               | SAH in basal cisterns; left ICA dissection and occlusion; RUE and RLE weakness | None                                           |
| Khan et al. (1985)[14] | 28  | Male| Right       | Psychotic depression; alcohol; amphetamines; LSD; marijuana | Own fingers               | SAH in the area of the right frontal lobe; LLE numbness and weakness | None                                           |
| Kotlus and Lo (2007)[5] | 31  | Female| Left       | Alcohol-induced psychosis               | Own fingers               | Moderate SAH; bilateral stroke and MCA vasospasm; contralateral vision loss | None                                           |
| Krauss et al. (1984)[15] | 29  | Female| Right       | Paranoid schizophrenia                   | Own fingers               | Contralateral hemianopsia due to optic chiasm damage | None                                           |
| Leibovitch et al. (2006)[16] | 35  | Male| Both       | Manic depressive disorder; marijuana; alcohol | Own fingers               | Bilateral CSF leaks | Oversowing of annulus of Zinn                   |
| Murphy et al. (2006)[7] | 67  | Female| Right       | Schizophrenia                           | Unknown                   | Diffuse SAH | Unknown                                       |
| Nabavizadeh et al. (2015)[8] | 51  | Female| Right       | “Mental retardation”                    | Unknown                   | Diffuse SAH in basal cisterns | None                                           |
| Rosenthal et al. (2011)[18] | 46  | Male| Left       | Schizoaffective disorder; recent discontinuation of medications | Unknown                   | Bilateral cerebral edema; subdural hematoma; right ICA thrombosis; left cortical stroke; brain death | None                                           |
| Schargus et al. (2009)[19] | 84  | Male| Left       | Advanced dementia; reactive depression | Own fingers               | SAH; optic chiasm lesion | None                                           |
| Shah et al. (2017)[20] | 46  | Male| Both       | Schizoaffective disorder                | Own fingers               | Brain death; SAH with midline shift; subdural hematoma; right ICA thrombosis; left cortical stroke | None                                           |
| Tabatabaei et al. (2011)[21] | 36  | Male| Right       | Ecstasy                                 | Fork                      | Contralateral hemianopsia due to optic chiasm damage | None                                           |
| Tuwir et al. (2005)[6] | 19  | Male| Right       | Acute psychosis induced by ecstasy; LSD; alcohol | Nail clipper and pliers   | Contralateral hemianopsia due to optic chiasm damage | None                                           |

CSF – Cerebrospinal fluid; ICA – Internal carotid artery; IVH – Intraventricular hemorrhage; LLE – Left lower extremity; LSD – Lysergic acid diethylamide; MCA – Middle cerebral artery; OA – Ophthalmic artery; RLE – Right lower extremity; RUE – Right upper extremity; SAH – Subarachnoid hemorrhage
A complication commonly reported in previous cases of self-enucleation but not seen in our patient is contralateral temporal field deficit (CTFC).[6,12,15,21,28] CTFC indicates chiasmal injury from avulsion of the optic nerve at its intracranial segment or more than 4 cm proximal to the optic globe and may improve with steroids.[28,29]

**Conclusion**

Self-enucleation is a dramatic and unfortunate complication of acute psychosis that presents as a neurologic, ophthalmologic, and psychiatric emergency. We reported a unique case of self-enucleation resulting in both SAH and ICA dissection and occlusion that improved initially with conservative management.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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