Neuropsychiatric manifestations of gangliocapsular lesions: A case series

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INTRODUCTION

Gangliocapsular region consists of basal ganglia nuclei (caudate nucleus and lentiform nucleus), thalamus, and internal capsule.[1] Disorders of basal ganglia typically present with movement disturbances and cognitive impairment.[2] Recent years have seen nonmotor manifestations of basal ganglia disease being increasingly recognized. Implications in various psychiatric disorders have been found.[3] Isolated psychiatric disturbances have also been reported. Among the psychiatric disorders, links between psychotic disorders and basal ganglia involvement have been strongly suspected. Here, we describe a case series with gangliocapsular lesions resulting in three different presentations – depression, mania, and psychosis.

CASE REPORTS

Case 1
A 24-year-old female presented with a history of sad mood, anergia, anhedonia, and cognitive slowing. Her symptoms started following bleeding from a ruptured thalamic arteriovenous malformation for 2 years. There was no similar past or family history. There was no history of any substance abuse. Magnetic resonance imaging of the brain done at the time of rupture of the lesion reported a hemorrhagic defect in the right gangliocapsular area measuring 3.4 cm × 3 cm with vasogenic edema. Compression of the third ventricle and dilation of both lateral ventricles with extravasation of blood had also occurred in the frontal horn of the right lateral ventricle.

Her complete blood counts and coagulation profile, thyroid profile, renal function tests, serum electrolytes, and fasting lipid profile were normal.

She had undergone burr hole exploration and embolization and thereafter gamma knife ablation of the malformed site. She was treated with fluoxetine 20 mg/day along with...
levetiracetam 500 mg/day. She had residual left hemiparesis for which she had been undergoing physiotherapy and hydrotherapy. She was started on escitalopram 15 mg/day as the patient was not responding to previous drug.

Case 2
A 38-year-old female, a known case of bipolar disorder and chronic kidney disease, presented with a 2-day history of left-sided hemiparesis involving the face. There were four episodes of mania during the last 8 years. There was no past or family history of similar illness. A history of any substance use was ruled out. Magnetic resonance imaging of the brain showed a tumour of size 56 mm × 32 mm × 43 mm in the right gangliocapsular region. The lesion extended up to the corona radiata, causing effacement of adjacent sulci, right lateral ventricle, and 3rd ventricle. There was mass effect on the right thalamus and midbrain with midline shift of 4 mm to the right with mild dilation of the left lateral ventricle.

Case 3
A 64-year-old gentleman presented with a 10-month history of delusions of reference and persecution and right-sided hemiparesis. These had started after a hemorrhage in the left gangliocapsular area. There was no past or family history. A history of any substance use was ruled out. Computerized tomography brain showed a 53 mm × 26 mm × 42 mm left gangliocapsular acute bleed extending from the left basal ganglia through internal capsule to the corona radiata. Perilesional edema with mass effect on the left lateral ventricle with midline shift of 4 mm toward the right was observed. Complete blood profile, renal function tests, liver function tests, random blood sugar, and serum electrolytes were done and were normal. He was put on quetiapine 50 mg along with clonazepam 0.25 mg.

DISCUSSION
Abnormalities of the basal ganglia have been implicated in a wide range of mental disorders. Of the mood disorders, both mania and depression have been reported. Two closely related basal ganglia circuits, namely limbic circuit and prefrontal circuit, have been implicated in depression. Both of them include the basal ganglia thalamocortical pathway. In a case–control postmortem study of brain of 16 patients with mood disorders, the patients had a 32% smaller left nucleus accumbens, 20% smaller left and right external pallidum, and 15% smaller right putamen.[4] This points to the role of basal ganglia in maintaining euthymia. Periventricular white matter hyperintensities, especially of the caudate nucleus, are well known in both bipolar depression and late-onset unipolar depression.

Laasonen-Balk et al.[5] believed depression to be associated with a reduced dopaminergic transmission, leading to consequent downregulation of dopamine transporter density, which was verified as true in depressed patients.
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Moore et al.\cite{6} found lower levels of beta-nucleoside triphosphate levels in basal ganglia in patients with untreated depression compared to controls, thus underlining pathology of basal ganglia in mood disorders. Brambilla et al.\cite{7} examined bipolar patients for structural abnormalities of basal ganglia and found total length of illness to correlate with smaller putamen volumes. Older patients with bipolar disorder also had a larger left globus pallidus.\cite{8} Beyer et al.\cite{9} noted smaller right caudate nuclear volumes in older patients with bipolar illness. Similar findings were observed in patients with unipolar depression. Lafer et al.\cite{10} reported the same observation in their functional magnetic resonance imaging studies in individuals with major depression.

Fatigue, a common neuropsychological presentation of depression, has been seen in disorders of the basal ganglia, most notably Parkinson's disease. Failure of integration of limbic output with basal ganglia structures has been implicated in its causation. A broader failure of the striato-thalamo-frontal cortical circuit has been postulated for above findings.\cite{10}

Concentrations of dopamine and its metabolites, homovanillic acid and dihydroxyphenylacetic acid, were studied in suicide survivors with retrospective diagnosis of major depression and compared with matched controls. Significantly lower values were found in all parts of basal ganglia, including caudate nucleus, putamen, and nucleus accumbens.\cite{11} Studies on brain-derived neurotropic factor levels in the nucleus accumbens of depressed individuals also point to their role in stress and depression.\cite{12} The difference in levels done for caudate nucleus was statistically significant. Neuroanatomical correlates for poststroke depression were explored by Morris et al.\cite{13} They noticed abnormalities of the left basal ganglia and gangliofrontal circuits to be more frequent with major depression compared to corresponding left-sided structures.

On the other hand, the connection between mania and basal ganglia pathology has not been so robustly studied. Caligiuri et al.\cite{14} showed that manic patients show altered activity on functional magnetic resonance imaging in the globus pallidus. This finding indicates involvement of this specific nucleus of the basal ganglia in mania. Johnson et al.\cite{15} reported a case of mania with psychotic symptoms, which was attributed to bilateral basal ganglia calcification. Our cases highlight similar findings and emphasize the role of basal ganglia and its connections in mental health.

Various researches on the role of basal ganglia in schizophrenia have also pointed to anomalies of the basal ganglia rich in dopaminergic neurons.\cite{16} Surface deformation mapping indicates localized volume reduction in caudate nucleus and putamen in antipsychotic-naïve patients; these changes were most pronounced in the associative striatum, and affective flattening was correlated with anterior putaminal abnormalities.\cite{17,18}

Ben-Shachar\cite{19} observed mitochondrial defects in basal ganglia neurons in schizophrenic patients. However, these implications cannot be generalized to psychosis alone. Postmortem and imaging studies also point to abnormalities of substantia nigra in schizophrenic patients.\cite{20} Post-antipsychotic use, general increase in the sizes of basal ganglia structures has been noticed.\cite{21} Gur et al.\cite{22} demonstrated a positive association between psychotic symptom severity and basal ganglia volumes in previously treated and neuroleptic-naïve patients with schizophrenia. Similar findings have also been seen in patients with autism and velocardiofacial syndrome.\cite{23} These findings point to genetic influence of psychosis on basal ganglia structures.\cite{23} Delusions and hallucinations caused by lesions in the basal ganglia are thought to occur due to disruption of normal self-corrective functions of mind. Thus leads to development to odd beliefs as well as impairment of the sense of familiarity which may contribute to paranoid ideation.\cite{24} Therein, lies the role of basal ganglia in psychosis.

CONCLUSIONS

It is important to maintain a high index of suspicion and rule out intracranial pathology, those of the basal ganglia included, in all cases of neuropsychiatric disturbances, especially in the absence of family history. Future studies are required to further explore the intricate role played by these nuclei in maintaining optimal mental health and in neuropsychiatric disturbances.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/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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