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Case Report

Depressive Episode Induced by Frontal Tumor Culminating in Suicidal Ideation

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Abstract

Depressive conditions are common psychiatric disorders with formidable and debilitating consequences. The association of brain lesions with depressive symptoms has been already reported. We describe a case of a patient, in whom a frontal lobe tumor was initially presented with a depressive episode. By discussing the neuropathological framework of depression we present an account of how localized brain lesions could give rise to depressive disorders. A failure in conventional antidepressant treatment might increase the risk of life-threatening consequences such as suicidal ideation. We therefore emphasize the importance of neuroimaging examinations in evaluation of depressive conditions even in the absence of focal neurological signs (German J Psychiatry 2010; 13 (3): 150–153).

Keywords: Depressive disorder, suicidal ideation, brain tumor

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Introduction

Brain tumors, either primary or metastatic, typically cause development of focal neurologic deficits such as hemiparesis, sensory deficit and aphasia. However, given the large-scale dynamics of cerebral neural networks other unpredictable functional consequences might appear. We report the case of a patient, in whom depressive symptoms culminating in suicidal ideation heralded the presence of a frontal lobe tumor, in the absence of neurological signs.

Case Report

A 31-year-old man was admitted with a 9-month history of depressive symptoms. He met the ICD-10 criteria for a major depressive episode (severe depressive episode without psychotic features, ICD-10: F32.1). The condition was characterized by severely depressed mood, poor concentration, fatigue, withdrawal from social activities, sleeplessness and suicidal ideation. These symptoms showed an exacerbation during the last 4 months. In further psychiatric examination slowing of thoughts and actions was noticeable. His medical history regarding psychiatric and other medical conditions was unremarkable.

The patient reported a positive family history of depression.
The general physical as well as neurological examination and neuropsychiatric evaluation upon admission revealed diplopia, but no other neurological deficit. In particular, no frontal release signs such as palmomental reflexes, pout or snout reflex and grasp reflex were noted. Plantars were normal. The binocular diplopia was along the horizontal axis in all directions. The patient also complained about a dull, non-lateralized headache. This and double vision had appeared about just about a few days before admission.
Laboratory evaluation, including TSH, was within normal limits.
A head computed tomogram (CT scan) on the day after admission revealed a large right frontal mass with associated edema and shift of the midline structures. The following MRI (contrast-enhanced) was consistent with a solitary large (47 x 30 x 30mm) mass lesion in the right frontal area close to the midline, surrounded by a vast edema (see the Figure).
Accordingly steroid therapy was applied to reduce the cerebral edema.
The patient underwent neurosurgical treatment one week after. The histopathological examination revealed the mass lesion to be a polycytic astrocytoma, WHO Grade I. Radiation therapy was planned subsequently.

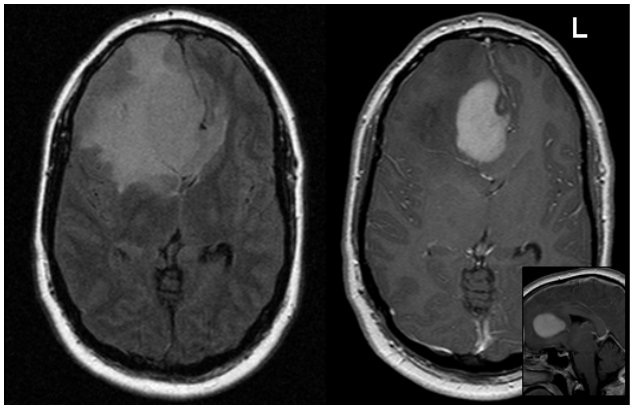

Figure 1. Magnetic resonance imaging scans before medical intervention. Left: FLAIR transverse view revealing signs of perifocal edema. Right: Contrast enhanced T1 weighted transverse view showing the location of tumor and the massive midline shift. Bottom: T1 weighted sagittal view

Discussion

Brain tumors may present multiple psychiatric symptoms such as mood alteration, anxiety, delirious state or amnesia (Habermeyer et al., 2008; John et al., 1997; Madhusoodanan et al., 2007; Moise & Madhusoodanan, 2006). We present a case of depressive episode induced by a frontal lobe tumor without accompanying neurologic deficits. The causality has been established by the temporal association. By reviewing the neuropathological framework of depression we aim at presenting an account of how a localized brain lesion such as a frontal lobe tumor could give rise to mood disorders. Admittedly, we mention that each neurologic condition affects a network of interrelated brain systems, limiting the assignment of pathologic mood disorders to certain brain structures.

Anatomical and functional alterations in specialized brain structures

Prefrontal structures are believed to have a potential role in mood regulation. Frontal lobe masses including tumors can produce mood disorders by changing the adjacent neural aggregates.

Functional imaging studies have repeatedly reported abnormalities in the neural activation patterns in depressive conditions. These abnormalities provide compelling evidence that specialized frontal brain structures such as OFC (orbitofrontal cortex) and mPFC (medial prefrontal cortex) underlie various cognitive and emotional functions with an implication in mood control, such as regulation of responses to aversive emotional experiences and interpretation of social and emotional cues (Phillips et al., 2003). Disturbance in the function of these areas can lead to mood disorders. The subgenual anterior cingulate cortex (sgACC), is another frontal lobe structure that has become increasingly recognized to have a key role in functional and structural models of mood regulation and pathophysiology of depression (Drevets et al., 1997; Drevets and Savitz, 2008).

Alterations in structural and functional connectivity

Interaction among the specialized systems which is mediated by functional and anatomical connections is essential for brain functioning. Localized brain lesions (such as tumors) can damage the global interconnections and thus impair functional specialization as well as integration.

Brain tumors could massively interrupt the structural connectivity by displacing white matter fiber pathways as it has been shown with diffusion tensor imaging techniques (DTI) (Yu et al., 2005).

The extensive and reciprocal projections between prefrontal cortex and limbic areas such as amygdala and hippocampus mediate the integration of sensory and limbic information and promote the goal-directed behaviour (Gabbott et al., 2005; Groenewegen and Uylings, 2000). Convexity lesions can disturb the sensory information flow to the mood-related regions leading to emotional dysregulations. On the other hand these types of injuries prevent limbic system output from reaching the motor areas. This prevents the integration of emotional-motivational impulses with motor activities, leading to psychomotor disturbances.

Functional imaging studies have revealed a decreased activation of frontal cortex structures (such as sgACC) (Drevets and Savitz, 2008) a simultaneously increased limbic activation (such as amygdala) (Sheline et al., 2001). Moreover,

corticolimbic connectivity abnormalities, which affect the reciprocal relationships between cortical mood regulating regions and limbic mood generating regions, has been already proposed to be present in depression (Anand et al., 2009; Anand et al., 2005; Mayberg, 1997). According to the network approach, lesions depending on the site and other properties can produce distributed changes in functional connectivity. Conceivably a frontal lobe tumor can induce patterns of altered functional connectivity among corticolimbic regions.

Cognitive and executive alterations

Aberrant cognitive and emotional processes with an increased negative bias in information processing are believed to be associated with mood disorders. Many of these functional disturbances are linked to frontal lobe (including dorsolateral and ventrolateral prefrontal cortex (DLPFC, VLPFC) and anterior cingulate cortex (ACC), since these structures are known to play an important role in cognitive control, thought and action (Duncan and Owen, 2000; Miller and Cohen, 2001). Given that, disorders of frontal structures can give rise to automatic thoughts, attention and memory distortions, dysfunctional beliefs and information-processing biases resulting in a depressive state.

As reviewed in previous articles (Drevets, 2007) most of the accompanying symptoms of a major depressive disorder (other than a depressed mood), such as apathy and anhedonia (altered reward processing), social anxiety (oversensitivity to negative feedback, ruminative thoughts of pessimism and guilt (inflexibility of thought and behavior), mood-congruent processing biases (altered integration of sensory and social information) and impaired attention and memory are linked to functional domains mediated by frontal lobe and prefrontal cortex, suggesting a role of these areas in the pathophysiology of mood disorders.

In humans, the frontal lobe supports the so-called executive system, an adaptable global system for the intentional control of thought and action, which governs the flexibility of human behavior (Shallice, 1988). Distortion of executive functioning in association with the abnormalities of frontal structures can affect the social and behavioural adaptation and accordingly slowness of thought and action, which is commonly observed in depressive conditions.

Conclusions

Our current understanding of the anatomical and functional brain networks could benefit from linking localized structural damage of brain networks and resulting variable functional disturbances. This approach adds to the common neuroimaging methods which usually measure brain activity dependent on behavior and are affected by individual cognitive strategies.
Furthermore, this case underlines that a careful search for the organic causes of psychiatric conditions is always warranted. Also, some patients with long-term neurologically silent brain tumors may present with psychiatric symptoms only. These subgroups of people are prone to misdiagnosis and, based on their nonresponsiveness to conventional antidepressant treatment, are at risk for the life-threatening consequences of suicidal ideation. Therefore, we emphasize the consideration of neuroimaging in patients with new-onset psychiatric conditions even in the absence of neurological symptoms.

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