Excusing "out of control" behaviour: brain tumour-related aggression

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Everyone gets angry from time to time, and for some people, anger seems to be the norm, rather than the exception. However, a relatively sudden shift in character to severe aggression is not considered 'normal.' This kind of aggressive behaviour escalated to an extreme in the case of a 55-year old Eastern European immigrant who, in a fit of rage, beat his wife to near-death with a hammer in 2008.1 Many similarly unfortunate events occur without attracting the attention of the medical community. This particular event, however, did not go unnoticed, as it involved a brain tumor. The patient has since been incarcerated for his actions, but could it be possible that the observed and documented changes in his behaviour were in fact the result of a tumor or its subsequent treatment? If medicine can provide an organic cause for his actions, should he be found criminally responsible for them? To be exact, should he even be prosecuted for an action he was not legally responsible for? In order to discuss the moral, medical and legal dilemmas that arise from such rare and complex cases, the pathogenesis of tumor-mediated aggression and its legal implications will be further explored.

Case

The patient presented with a one week history of headaches, aphasia and right hemi-paresis. A T1 weighted MRI and subsequent biopsy of the tumor confirmed a large glioblastoma (GB) in the left hemisphere, involving the frontal, temporal and occipital lobes.2 A glioblastoma is a grade 4 astrocytoma, characterized by high mitotic activity and necrosis or endothelial proliferation.2 The patient was subsequently treated for six weeks with concomitant radiation and chemotherapy. Throughout treatment, the patients’ family complained of new onset paranoia, despite no past psychiatric illness. His family denied any aggressive behavior. In spite of repeated suggestions from his physicians to obtain a psychiatric evaluation, both the patient and his family refused. Although his motor functions improved throughout the treatment, to the utter vexation of his family, his emotional detachment failed to benefit from the shrinking tumor.1 Upon further requests for psychiatric evaluation, the patient discontinued (or withdrew) from treatment altogether. He was arrested eight months later for savagely beating his wife, in what can only be presumed to have been a fit of extreme, unbridled rage.1

Physiology and behaviour

The physiologic functions of the limbic system were discovered in the first half of the twentieth century.3 Hughlings Jackson had delineated the temporal lobe (specifically, the amygdala) in the early 19th century as the origin for anger, aggression and rage.4 Studies demonstrating its role in human emotions were performed in 1963 and 1977, showing that stimulation of the amygdaloid nuclei induced a strong aggressive response.4 A mechanism of aggressive behavior production has been demonstrated in several recent studies on children with epilepsy, which can be extrapolated to those with tumor-associated seizures. These children with aggressive behavior and intractable partial epilepsy demonstrated glucose hypometabolism (which may be indicative of decreased neuronal activity) in temporal and prefrontal areas when compared to control subjects and nonaggressive children with partial epilepsy.5 It is thought that in normal children, these areas suppress aggression triggered by the activation of limbic structures, and that loss of function in these areas results in loss of frontal lobe control.6

It is well documented that tumors of the temporal lobe can cause seizures.2 Despite the rarity of their occurrence, some of these patients also manifest post-seizure aggression and other behavioral changes, which may be associated with the tumor. In documented pediatric cases, two children (both boys, aged 5 and 13) were found to have excessively aggressive behavior, which improved upon surgical resection of their tumors: a meningioma and a ganglioma, respectively, both in the right temporal lobe.6

The patient in this case had cognitive impairments that are consistent with lesions in the left frontal, parietal and temporal lobes. Neuroimaging studies on aggressive and violent offenders have demonstrated a correlation between dysfunction of these areas and aggression and violent behavior.7

Social and legal implications

Aggression and the gradation of related emotions have always existed within normal social behavior. It manifests in early infancy, as children procure from their caretakers the attention needed to survive.3 While in most cultures rage and aggressive outbursts are not tolerated, we must, as a society, consider the etiology of this aggression. The rapid transition a person can make from a state of reason to one of uncontrollable anger is rarely appreciated as a possible manifestation of disease.1 Underlying illness should be considered when the reaction is grossly disproportionate to the provoking stimulus or out of character for the patient. The possibility of a brain lesion leading to acts of extreme violence, while a rare occurrence, can have tremendous implications in the legal approach to such cases.

The role of the physician must be established in treating patients who may potentially harm themselves or others as a result of their changed behavior. The ruling in Tarasoff v. Regents of the University of California (1976)
determined that physicians have an obligation to protect public safety and can or must breach patient confidentiality to warn those potentially at risk of impending danger.\(^8\) As a result, patients who are demonstrating signs of aggressive or violent behavior require careful scrutiny throughout treatment and beyond, from both health care providers and family, in order to prevent a tragic outcome.

In addition, the role of medical forensics in the judicial system is of increasing importance, as science and medicine are increasingly able to describe biological influences in the development of criminal behavior. Advancements in neuroimaging, such as CT and fMRI have afforded scientists the ability to search for organic causes of aggressive and violent behavior.\(^7,9\) In fact, the use of neuroimaging in criminal trials has increased as part of an attempt to mitigate penalties during sentencing hearings.\(^11\) However, not everyone is convinced of its use in a justice system based on free will. Some argue that searching for a root cause in every situation will decrease criminal liability. However, mitigating factors should not be ignored for the sake of upholding an unaccommodating penal system. Our judicial system relies on the principle of fundamental justice: when personal freedom will be restricted, the State has the onus to prove intent and act (Mens rea, actus rea).\(^10\)

Thus, Greene and Cohen (2004) believe that:

> [N]euroscience will likely have a transformative effect on the law, despite the fact that existing legal doctrine can, in principle, accommodate whatever neuroscience will tell us. New neuroscience will change the law, not by undermining its current assumptions, but by transforming people’s moral intuitions about free will and responsibility.\(^11\)

The Canadian Criminal Code, Part XX.1, states that “A person can be found not criminally responsible by reason of mental disorder.”\(^12\) The legal test applied requires that the accused did not appreciate the nature and quality of the criminal act or omission or know that it was wrong. Therefore, physicians must be educated and have an enhanced awareness of the emotional and behavioral ramifications neurological disease and dysfunction may pose. In fulfilling their duty to advocate for patient welfare, physicians can promote new approaches, both medically and legally, to such situations, and potentially prevent wrongful convictions.

**References**

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