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The Case for Neurosurgical Intervention in Cancer Neuroscience

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Abstract

The emerging field of cancer neuroscience reshapes our understanding of the intricate relationship between the nervous system and cancer biology; this new paradigm is likely to fundamentally change and advance neuro-oncological care. The profound interplay between cancers and the nervous system is reciprocal: Cancer growth can be induced and regulated by the nervous system; conversely, tumors can themselves alter the nervous system. Such crosstalk between cancer cells and the nervous system is evident in both the peripheral and central nervous systems. Recent advances have uncovered numerous direct neuron-cancer interactions at glioma-neuronal synapses, paracrine mechanisms within the tumor microenvironment, and indirect neuroimmune interactions. Neurosurgeons have historically played a central role in neuro-oncological care, and as the field of cancer neuroscience is becoming increasingly established, the role of neurosurgical intervention is becoming clearer. Examples include peripheral denervation procedures, delineation of neuron-glioma networks, development of neuroprostheses, neuromodulatory procedures, and advanced local delivery systems. The present review seeks to highlight key cancer neuroscience mechanisms with neurosurgical implications and outline the future role of neurosurgical intervention in cancer neuroscience.