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The human battle with glioblastoma multiforme: A true challenge

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Glioblastoma Multiforme(GBM), the most common primary brain tumor, is a malignant tumor often forming in the cerebral hemisphere of the brain. This tumor originates from mutated astrocytes, which are cells that begin to reproduce uncontrollably and are supplied generously via nearby blood vessels. Glioblastomas are derived from healthy brain cells, thus are capable of living and flourishing within the cerebral cavity. Glioblastomas take on two forms, primary and secondary, which are distinguished by their respective rate of growth. Primary glioblastomas are aggressive and form rapidly, while secondary giloblastomas proliferate at slower rates and transform into aggressive tumors from more initially benign lesions [1-4].

In 2017 thus far, there have been an upwards of 138,000 malignant brain tumor cases, in which 15.4% are GBM tumors and 3% are brain tumors arising during childhood. Patients with glioblastoma often present with primary chief complaints of headache, nausea, drowsiness, and vomiting. Depending on the volume of the tumor and exact location within the central nervous system, additional symptoms such as weakness, memory loss and speech impairment may also be observed. Please note that not all headaches indicate that someone will have a GBM. In fact, most headaches are not indicative of GBM and are likely related to myofascial inflammation of the neck muscles and/or migraines [5-8].

The diagnosis of glioblastoma is conducted by a neurologist or neurological surgeon in which diagnostic imaging is utilized to visualize the exact location of the tumor, size and shape. Classically, patients have undergone a Computed Tomography (CT) scan of the head showing a lesion in the brain. Magnetic resonance imaging (MRI) is then obtained to identify more precisely the size, shape, location and anatomical morphology of the brain tumor. MRI imaging also reveals protruding regions of the tumor such as the tentacles of tumor spread and growth, as well as the three-dimensional analysis of the tumor's proliferation. Diffusion Tensor Imaging (DTI) is commonly used to identify tumor infiltration into the parenchyma of the brain by providing a picture of the actual neurons of the brain in relation to the tumor. This imaging modality, along with neuronavigation guidance, are used intraoperatively during resection of the tumors for maximal patient safety and outcome [9-20].

Glioblastoma's are characterized as World Health Organization (WHO) grade IV tumors, which are tremendously aggressive and often causes mortality within an average one year of onset. GBM is by far the most polymorphic neoplastic tumor with undefined spherical boarders often observed crossing from one hemisphere to the other hemisphere on MRI and CT scans. Treatment of GBM involves the surgical debulking of the tumor if in a non-high-risk location of the brain. In complex cases where location of the tumor creates surgical difficulties, the tumor may not be removed at all. Instead, radiation therapy can be utilized to kill as many tumor cells as possible. In addition, chemotherapeutic agents such as Temozolomide can also be utilized to halt or reduce the spread of the tumor. Additionally, combination of surgical debulking, whole brain radiation therapy, and chemotherapy regimen used adjunctively provide the best current outcomes. Recently, electric field therapy has become an option in which electrical fields are used to target the tumor cells while leaving healthy cells unharmed. With the severity of cases varying from patient to patient, many of the above treatments can serve as valid and beneficial treatments to GBM. Current research with formation of vaccines is underway with hopes of eradicating this terrible human cancer. Novel techniques investigating creative therapeutics involving stem cells, nanotechnology, and molecular medicine are underway which all strive for tumor selectivity. Depending on treatment route chosen, prognosis of the patient's recovery is generally quite poor within one year after treatment. The future of GBM resides in the development of novel treatments and medications that can selectively target tumor cells as opposed to normal brain cells [21-31].

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