Bionaut™: A Microrobotic Drug-Device Platform for the Local Treatment of Brainstem Gliomas

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Abstract : Despite the most aggressive surgical and adjuvant therapeutic strategies, treatment of both pediatric and adult brainstem tumors remains problematic. Novel strategies, including targeted biologics, immunotherapy, and specialized delivery systems such as convection-enhanced delivery (CED), have been proposed. While some of these novel treatments are entering phase I trials, the field is still in need of treatment(s) that exhibits dramatically enhanced potency with optimal therapeutic ratio. Bionaut Labs has developed a modular microrobotic platform for performing localized delivery of diverse therapeutics in vivo. Our biocompatible particles (Bionauts™) are externally propelled and visualized in real-time. Bionauts™ are specifically designed to enhance the effect of radiation therapy via anatomically precise delivery of a radiosensitizing agent, as exemplified by temozolomide (TMZ) and Avastin™ to the brainstem gliomas of diverse origin. The treatment protocol is designed to furnish a better therapeutic outcome due to the localized (vs systemic) delivery of the drug to the neoplastic lesion(s) for use as a synergistic combination of radiation and radiosensitizing agent. In addition, the procedure is minimally invasive and is expected to be appropriate for both adult and pediatric patients. Current progress, including platform optimization, selection of the lead radiosensitizer as well as in vivo safety studies of the Bionauts™ in large animals, specifically the spine and the brain of porcine and ovine models, will be discussed.

Keywords : Bionaut, brainstem, glioma, local delivery, micro-robot, radiosensitizer
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