

Biophysical Features of Glioma-Derived Extracellular Vesicles as Potential Diagnostic Markers

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Abstract : Glioma is a lethal brain cancer whose early diagnosis and prognosis are limited due to the dearth of a suitable technique for its early detection. Current approaches, including magnetic resonance imaging (MRI), computed tomography (CT), and invasive biopsy for the diagnosis of this lethal disease, hold several limitations, demanding an alternative method. Recently, extracellular vesicles (EVs) have been used in numerous biomarker studies, majorly exosomes and microvesicles (MVs), which are found in most of the cells and biofluids, including blood, cerebrospinal fluid (CSF), and urine. Remarkably, glioma cells (GMs) release a high number of EVs, which are found to cross the blood-brain-barrier (BBB) and impersonate the constituents of parent GMs including protein, and lncRNA; however, biophysical properties of EVs have not been explored yet as a biomarker for glioma. We isolated EVs from cell culture conditioned medium of GMs and regular primary culture, blood, and urine of wild-type (WT)- and glioma mouse models, and characterized by nano tracking analyzer, transmission electron microscopy, immunogold-EM, and differential light scanning. Next, we measured the biophysical parameters of GMs-EVs by using atomic force microscopy. Further, the functional constituents of EVs were examined by FTIR and Raman spectroscopy. Exosomes and MVs-derived from GMs, blood, and urine showed distinction biophysical parameters (roughness, adhesion force, and stiffness) and different from that of regular primary glial cells, WT-blood, and -urine, which can be attributed to the characteristic functional constituents. Therefore, biophysical features can be potential diagnostic biomarkers for glioma.

Keywords : glioma, extracellular vesicles, exosomes, microvesicles, biophysical properties

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