Theranostics in Brain Tumors

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KEYWORDS

• Theranostics • Brain tumor • PET/CT • PET/MR imaging • Neuro-oncology • Neurotheranostics
• Radioneurotheranostics

KEY POINTS

- Theranostic nuclear oncology, mainly in neuro-oncology (neurotheranostics), aims to combine cancer imaging and therapy using the same molecular targeting platform.
- The ability of radioneurotheranostic agents to interact with cancer cells at the molecular level with high specificity can significantly improve the effectiveness of cancer therapy and helps to identify patients who are most likely to benefit from tumor molecular radionuclide therapy.
- A variety of biologic targets are under investigation for treating brain tumors.
- PET-based precision imaging can substantially improve the therapeutic efficacy of radiotheranostic approach in brain tumors.

INTRODUCTION

Brain tumors are divided into primary brain tumors, which originate from the brain itself, and metastatic brain tumors, which originate from the tumors of other body parts. According to the World Health Organization (WHO) grading system, primary brain tumors are classified as low-grade tumors (grade I–II) and high-grade tumors (grade III–IV). Furthermore, the most common metastatic brain tumors originate from the breast, lung, and skin (melanoma).[1] Among the high grade gliomas, there is differentiation based on origin of the tumor, such as secondary high grade gliomas are transformed from lower grade gliomas. On the other hand, primary glioblastomas commonly do not have a precursor lesion.[2] Among primary brain gliomas, glioblastoma (GBM) is the most frequent and most lethal primary brain tumor.