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Locoregional Treatment of Glioblastoma With Targeted α Therapy: [213Bi]Bi-DOTA-Substance P Versus [225Ac]Ac-DOTA-Substance P-Analysis of Influence Parameters

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Abstract

Background: Glioblastoma (GB) is the most malignant primary brain tumor. Therefore, introduction of new treatment options is critically important. The aim of this study was to assess local treatment with α emitters [213Bi]Bi-DOTA-substance P (SP) and [225Ac]Ac-DOTA-SP.

Methods: Treatment was performed as salvage therapy in patients with recurrent primary and secondary GB. [213Bi]Bi-DOTA-SP with injected activity 1.85 GBq per cycle was used in 20 primary (48.2 ± 11.8 years old) and in 9 secondary (38.8 ± 10.8 years old) GB patients and [225Ac]Ac-DOTA-SP in 15 primary (45.1 ± 9.9 years old) and in 6 secondary (37.8 ± 6.4 years old) GB patients with a dose escalation scheme (10, 20, and 30 MBq).

Results: Local treatment with [213Bi]Bi-DOTA-SP and [225Ac]Ac-DOTA-SP was well tolerated with only few adverse effects. There was no statistically significant difference between [213Bi]Bi-DOTA-SP and [225Ac]Ac-DOTA-SP groups in survival parameters. For primary GB, survival parameters of patients treated with [213Bi]Bi-DOTA-SP and [225Ac]Ac-DOTA-SP were as follows(in months): progression-free survival time, 2.7 versus 2.4; OS-d (overall survival from time of diagnosis to death from any cause), 23.6 versus 21.0; OS-t (overall survival from the start of treatment to death from any cause), 7.5 versus 5.0; and OS-r (overall survival from recurrence in primary tumors to death from any cause), 10.9 versus 12.0. Survival parameters of secondary GB patients treated with [213Bi]Bi-DOTA-SP and [225Ac]Ac-DOTA-SP were as follows (in months): progression-free survival time, 5.8 versus 2.4; OS-d, 52.3 versus 65.0; OS-t, 16.4 versus 16.0; and OS-c (overall survival from conversion into secondary GB multiforme to death from any cause), 18.4 versus 36.0.

Conclusions: The similarity results of 213Bi or 225Ac may suggest that the local treatment of brain tumors can be greatly simplified. The experience to date shows that local radioisotope treatment of brain tumors requires further dosimetry studies, taking into account the complexity of biological processes.

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