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International Journal of Radiation

Oncology*Biography*Physics

Volume 37, Issue 3, 1 February 1997, Pages 491-497

Pion radiation for high grade astrocytoma: Results of a randomized study $\hat{\sim}\dagger$

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[https://doi.org/10.1016/S0360-3016\(96\)00542-1](https://doi.org/10.1016/S0360-3016(96)00542-1)

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Abstract

Purpose: This study attempted to compare within a randomized study the outcome of pion radiation therapy vs. conventional photon irradiation for the treatment of high-grade astrocytomas.

Methods and Materials: Eighty-four patients were randomized to pion therapy (33–34.5 Gy), or conventional photon irradiation (60 Gy). Entry criteria included astrocytoma (modified Kernohan high Grade 3 or Grade 4), age 18–70, Karnofsky performance status (KPS) ≥ 50 , ability to start irradiation within 30 days of surgery, unifocal tumor and treatment volume < 850 cc. The high-dose volume in both arms was computed tomography enhancement plus a 2-cm margin. The study was designed with the power to detect a twofold difference between arms.

Results: Eighty-one eligible patients were equally balanced for all known prognostic variables. Pion patients started radiation 7 days earlier on average than photon patients, but other treatment-related variables did not differ. There were no significant differences for either early or late radiation toxicity between treatment arms. Actuarial survival was 10 months in both arms ($p = 0.22$). The physician-assessed KPS and patient-assessed quality of life (QOL) measurements were generally maintained within 10 percentage points until shortly before tumor recurrence. There was no apparent difference in the serial KPS or QOL scores between treatment arms.

Conclusion: In contrast to high linear energy transfer (LET) therapy for central nervous system tumors, such as neutron or neon therapy, the safety of pion therapy, which is of intermediate LET, has been reaffirmed. However, this study has demonstrated no therapeutic gain for pion therapy of glioblastoma.



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Keywords

Radiotherapy; Particle therapy; Pions; Astrocytoma; Quality of life; Clinical trial Phase 3

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