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Clinical Experiences of Proton Beam Therapy in Locally Advanced Pancreatic Cancer

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Objectives

Proton beam therapy (PBT) is being increasingly explored as a treatment for locally advanced pancreatic cancer (LAPC). The goal of this strategy is to improve local tumor control, reduce side effects, and shorten the treatment period; however, substantial clinical evidence supporting its use is still limited.

Methods

This retrospective study analyzed 225 patients with LAPC who received PBT. The treatment consisted of 10 fractions, delivering a radiation dose of 45-50 GyE to the planning tumor volume 1 (PTV1) and 30 GyE to the planning target volume 2 (PTV2). Patients were categorized based on their treatment order: Group I (48.9%) received PBT after their disease stabilized with induction chemotherapy, Group II (15.6%) received PBT after their disease worsened on chemotherapy, and Group III (35.6%) had PBT first, followed by maintenance chemotherapy.

Results

The median overall survival (OS) was 24.2 months from the commencement of first treatment and 19.5 months from the PBT. Patients in Group I had a significantly longer OS time compared to those in Groups II and III ($p<0.05$). A higher radiation dose of 50 GyE was linked to a significant survival advantage (OS from first treatment: 25.6 vs. 19.3 months; $p = 0.001$) and a markedly lower chance of local disease recurrence ($p=0.003$ from PBT). The PBT was well-tolerated, with predominantly mild acute events and a 4% incidence of severe late GI toxicity.

Conclusions

This investigation, the largest of its kind for PBT in LAPC, indicates that PBT is a safe and effective method for local treatment. The most favorable results were achieved when PBT was given after stabilizing the cancer with chemotherapy, and a dose-response relationship was apparent. These encouraging outcomes need to be validated by future prospective clinical studies.