

## A Prospective Single Institution Experience in Proton Spatially Fractionated Radiotherapy

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**Abstract**

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### Abstract

**Objectives:**

Spatial fractionation (SFRT) is a radiotherapy method that can address bulky tumors by alternating areas of high and low dose within gross disease, however conventional methods of SFRT including photon GRID may not adequately address tumor without delivering excess, unsafe dose to adjacent normal organs. Here, we report an interim analysis of a phase I trial examining the feasibility, reliability, and safety of a novel proton GRID therapy technique.

**Methods:**

Ten patients with unresectable tumors of varying histopathology measuring at least 7 cm in the palliative setting were enrolled onto a prospective phase I trial. Robust pencil-beam scanning proton GRID plans were created using cylindrical targets within gross tumor treated to prescription dose of 18 Gy in a single fraction. Quality assurance CT-imaging (QACT) was performed prior to treatment delivery.

**Results:**

Four patients had breast primaries, 3 patients had lung primaries, and 3 patients had pelvic primaries. Five patients had prior photon treatment to a different site. Eight patients received additional planned normo-fractionated radiotherapy totaling an average dose of 30 Gy. Median time from GRID treatment to last follow-up was 25 weeks (range: 4–60 weeks). Gross tumor volume (GTV) ranged from 151 cm<sup>3</sup> to 1638 cm<sup>3</sup>. Robustness was maintained on all QACTs and did not result in replanning for any subject. Forty percent had a partial response, 20% had stable disease, and 40% had disease progression at last follow up. There were no grade 3 or higher acute toxicities attributable to the proton GRID therapy.

**Conclusion(s):**

Spatial fractionation using a novel pencil-beam scanning GRID technique was technically feasible to deliver and reliable on robust evaluation of QACT in this small prospective cohort of patients with difficult-to-manage bulky tumors. Proton GRID appears safe even when additional normo-fractionated radiotherapy is delivered. Some bulky tumors exhibited significant response to proton GRID; thus, further work elucidating which patients most benefit from this technique are warranted.