Purpose: To develop a simple method of generating megavoltage beamlet arrays for efficient grid therapy.

Methods: Multileaf collimators (MLC) were constructed by mounting equally-spaced, rectangular, lead sheets on Varian linac block trays, in a divergent geometry. The lead leaves were positioned orthogonal to the same alternating leaf pattern beneath a Varian MLC. Lead sheets with nominal thicknesses of 6.4, 3.2 and 1.6 mm resulted in projected beamlets at linac isocenter of 10x10, 5x5 and 5x2.5 mm respectively. Relative to an open beam, the symmetric grid beam area is 25% open, 50% shadow of single MLC leaf and 25% shadow of overlapping MLC leaves. Kodak EDR-2 film, ISP Gafchromic EBT film and leuco crystal violet micelle gels with optical cone beam CT readout were used to characterize dose distributions. The impact of the x-ray beam flattening filter was measured by operating the Varian 2100 series linac in 6 MV mode with and without the filter. Modulation ratios were recorded at water depths of 15 to 200 mm. Orthogonal 5x5 mm grid beams offset by 5 mm were delivered to a 95 mm diameter cylinder of gel in a cubic water phantom at 100 mm depths.

Results: Dose rates from beamlet arrays and single beamlets, defined by linac jaws, were similar. Removing the flattening filter doubled the dose rate but had a minor effect on dose modulation. Optical density modulation ratio (5x5 mm beamlet / single leaf shadow) decreased from 7 at 15 mm to 4 at 200 mm depth in water. The gel 3D distribution demonstrated the anticipated features of intersecting diverging beamlet arrays with central dose modulations of 3.5.

Conclusions: A hybrid system of orthogonal linac and block tray MLC leaves provides a simple method of generating arrays of megavoltage photon beamlets for efficient delivery of grid therapy.

Funding Support, Disclosures, and Conflict of Interest:

W Francis was partially supported by a London Regional Cancer Program Small Grants for grid therapy development.

There are no conflicts of interest with this work