

Dosimetric investigation of the requirements needed for :Title 13244 :AbstractID
Elekta machines to perform modulated electron radiation therapy

Purpose: Several studies have examined different ways for Varian and Siemens linear accelerators to deliver modulated electron radiation therapy (MERT) either utilizing existing photon multileaf collimator (pMLC) or designing an electron specific multileaf collimator (eMLC). The aim of this work is to investigate all possible options for Elekta machines to deliver modulated electron beams.

Material and methods: Electron beam characteristics were studied in absence of the electron applicator and with the beams collimated by the existing pMLC. Percentage depth doses and profiles were compared with those collimated by electron applicators for all available energies. Electron beam collimation by the lower jaws was examined using profiles taken for all available energies to investigate the possible outcome if the lower jaws are replaced by an eMLC. A specific Multileaf collimator that could be attached to the treatment head was also studied using a low melting alloy (cerrobend) that can be manually mounted on the machine. Percentage depth doses and profiles for a square field formed by the low melting alloy for all available electron energies were compared with those collimated by applicators of comparable sizes.

Results: Profiles for electron beams collimated by the pMLC showed very large penumbra even at the lowest SSD. Even if the pMLC of an Elekta machine replaced the lower jaws, an SSD as low as 70 cm would be needed to obtain a penumbra comparable to that collimated by an electron applicator. Profiles from the eMLC showed similar penumbra to that collimated by electron applicators for all energies.

Conclusion: As is expected, the current position of the pMLC on Elekta machines is not suitable for MERT dose delivery. A more practical option for Elekta machines is to develop a specific eMLC.