Abstract:

Purpose: To improve local tumor control and/or to reduce sequelae in complex planning situations we have implemented inversely-planned intensity-modulated treatments delivered by casted compensators in clinical practice at dkfz.

Material&Method: The compensators are composed of typically 5 layers of lead alloy with a thickness of up to 15 mm (about the half values thickness). For each layer, a casting mould (polyurethane foam) is produced by a computer-controlled milling machine according to the calculated thickness profile and filled with a lead alloy. The layers are assembled to form a composite compensator to be mounted on the accessory tray of the linac. In order to assess the accuracy of the delivery of intensity-modulated treatments using compensators, extensive dosimetric verifications were performed using compensators produced for different predefined fluence profiles. For the clinical implementation, optimized intensity distributions are calculated using the inverse treatment planning program KonRad developed at dkfz. To assure a safe treatment delivery, an extensive quality assurance program was established.

Results: The treatment time using compensators is short (about 12 min for 5 beams) at the expense of a time-consuming manufacturing process (about 4 hours for 5 beams). Calculated and measured dose distributions, both for arbitrarily designed fluence patterns and clinically relevant fields generated by the inverse planning method, were found to agree within 2% which is well within clinically acceptable limits.

Conclusion: Inversely-planned intensity-modulated treatments can be safely and accurately realized by the use of casted compensators.