

#### Purpose:

To evaluate the optimization strategies for midline and peripheral tumours for IMRT and RapidArc treatments using phantom and its clinical validation by comparing with different plans.

#### Methods:

Homogeneous phantom was CT scanned and PTV was delineated for two different positions (midline and periphery). Two organs at risk with different shapes (organ at risk 1, organ at risk 2) were created. Planning was done for IMRT and RapidArc with OAR-1, placed at distance of 0.5cm and 2cm. Also OAR-2, placed at a distance of 1cm and 2.5cm from the border of PTV along the central axis. The phantom study was clinically verified by comparing different treatment plans.

#### Results:

Dose homogeneity was almost similar for tumours in the midline where OAR's are far. RapidArc plans show superior dose homogeneity, when the target is situated at the periphery and OAR's are very near to PTV (homogeneity index 2.67 for RapidArc and homogeneity index 4.03 for IMRT). Target coverage was better for all RapidArc plans with maximum conformity index 1.01. The sparing of OAR in terms of the maximum dose was better in RapidArc. A considerable reduction in OAR mean dose (12.37% for OAR-1 and 10.23% for OAR-2) was observed with RapidArc technique for peripheral tumors. For healthy tissue no significant changes were observed in terms of the mean dose and integral dose. But RapidArc plans show a reduction in the volume of the healthy tissue irradiation above V10Gy for targets at the periphery and OAR near.

#### Conclusions:

Either IMRT or RapidArc can be chosen for tumours in the mid line. Particularly Rapid Arc treatment can be recommended for tumours which are situated at the periphery and organs at risk in close proximity. The clinical validation with different treatment plans well supported the phantom study.