Purpose:

Previous researches reported that RapidArc plans for stereotactic cranial radiotherapy have two to three times more MUs as compared to Conventional Dynamic Conformal Arc (DCA) Technique. This study aims to evaluate RapidArc plans using multiple non-coplanar arcs, developed with MU objective constraint in the optimization stage

Methods:

Five single brain metastasis and three multiple metastases cases previously planned using DCA techniques in BrainLab iPlan Version 4.1 were investigated in this study. For each case, the target was defined on CT-MR fused images in iPlan. The CT images and contours of these patients were exported from iPlan to Varian Eclipse TPS Version 8.6. For each case, a DCA plan and a RapidArc plan with multiple non-coplanar arcs with and without using MU objective in the optimization stage were generated using Varian Trilogy machine with Millennium 120 MLC keeping the same prescription and critical structure dose limits. All plans were evaluated according to Conformity Index (CI-modified Paddick) Homogeneity Index (HI), and the normal tissue volume receiving various dose levels (V80%, V50%, V25% and V10%).

Results:

In all the plans, the target objectives were met and dose to OARs was within tolerance dose constraints. RapidArc plans with and without MU objective showed better CI and HI as supposed to DCA plans. V80%, V50%, V25% and V10% of normal tissue for RapidArc plans are equal or lesser than DCA plans. Single isocentre RapidArc plan for closely spaced multiple metastases cases showed better dose fall off between the lesions as supposed to DCA plans. RapidArc plans with MU objective resulted in comparable MUs as that of DCA plans.

Conclusions:

Our study showed RapidArc plans done with and without MU objective have no significant dosimetric difference in plan objectives. Therefore, multiple non-coplanar RapidArc plans with MU objective is clinically feasible and can provide better treatment plans than conventional DCA plans, especially for complicated cases.