Purpose: To investigate the feasibility of multiple RapidArc-based stereotactic radiosurgery (SRS) and fractionated stereotactic radiotherapy (SRT) for the treatment of intracranial tumors and evaluate the plan quality by comparing with conventional dynamic conformal arc (DCA) plans.

Methods: Ten intracranial SRS/SRT cases previously planned using DCA or cone-based techniques were investigated in this study. The CT images and contours of these patients were pushed from a Brainlab i-plan or a Cyberknife Multiplan to a Varian Eclipse TPS system. For each case, a DCA plan and a RapidArc plan with multiple non-coplanar arcs, as well as a single RapidArc plan, were generated using a TrueBeam machine with a high-definition MLC using the same prescription and critical structure dose limits. To evaluate plan quality, dosimetric indices of conformity index, homogeneity index, and the normal tissue volume receiving low dose radiation (V50, V25 and V10), were calculated and compared for different plans.

Results: With similar critical structure sparing, multiple RapidArc-based plans can achieve much better target coverage, dose conformity, and dose homogeneity compared to the DCA plans. V50, V25 and V10 of normal brain tissue were similar for DCA and multiple RapidArc plans, but much larger for the single RapidArc plan although similar target dose performances as the multiple RapidArc plan may be achievable in simple situations, such as no critical structure nearby. MUs were found higher for the RapidArc plans. However if high dose rate flattening filter free mode is used, the treatment time is similar to the DCA plans.

Conclusions: Multiple RapidArc SRS/SBT is clinical feasible and can provide better treatment plans than conventional dynamic arc plans, especially for complicated cases.