Purpose: Contrast-enhanced stereotactic synchrotron radiation therapy (SSRT) is an innovative technique based on localized dose-enhancement effects obtained by reinforced photoelectric absorption in the target. Medium energy monochromatic x-rays (50-100 keV) are used for irradiating tumors previously loaded with high-Z elements. SSRT clinical trials are being prepared at the European Synchrotron Radiation Facility (ESRF). The first patients (scheduled in summer-autumn 2011) should be treated at 80 keV, with 10 conformational beams. A dry run has been performed using an anthropomorphic radiosurgery human head phantom (Computerized Imaging Reference Systems, Norfolk, VA, USA).

Methods: The phantom was scanned on a dedicated CT-scanner, with and without a 3 cm diameter latex balloon filled with 3 mg/ml of iodine located in the supratentorial brain area. The PTV as well as the OAR were then contoured. The first patient should receive 5 Gy at the ESRF in one fraction followed by a 6 Gy fraction and two 11 Gy fractions at the university hospital under stereotactic conditions (6 MV). The treatment will be followed by a whole brain irradiation (30 Gy, 10 fractions of 3 Gy, 6 MV). The treatment plan for the conventional stereotactic and whole brain irradiations were performed respectively on the Brainlab-IPlan system, and on the Varian-Eclipse TPS. The contrast enhanced SSRT treatment plan is performed on the ESRF dedicated version of Isogray (Dosisoft, Cachan, France) that has been developed for our irradiation technique.

Results: The treatment plan was then successfully evaluated (Isodoses, DVHs and ICRU points). The full treatment was then realized on the phantom. Dose verifications were performed using gafchromic films and nPaG polymer gel dosimetry as well as in vivo dosimetry.

Conclusions: This contrast enhanced SSRT clinical trial "dry run" was the last step before the phase I/II trial and shows the feasibility and readiness of the whole treatment chain.