Background: High incidence (up to 40%) of clinically silent cerebral ischemia (SCI) on diffusion-weighted (DW) MRI has been consistently demonstrated after pulmonary vein isolation (PVI) using duty-cycled radiofrequency (RF) ablation with a multipolar circular ablation catheter (PVAC). Our group has also demonstrated a significantly higher number of microembolic signals (MES) on Transcranial Doppler (TCD) with PVAC as compared to cryoballoon ablation (CBA). Power and temperature handling algorithms of the GENius™ RF generator used for PVAC ablations have recently been modified to avoid temperature overshoots aiming at a reduced thrombogenic potential. We compared the incidence of microembolization during PVAC ablation with the old versus the modified version of the GENius™ generator as assessed by TCD. In addition, we investigated the incidence of new silent cerebral lesions on DW MRI using the modified generator and an aggressive periprocedural anticoagulation protocol.

Methods and Results: 43 consecutive patients (age: 59±11, female: 15) with paroxysmal or persistent atrial fibrillation undergoing PVI using PVAC and the modified GENius™ 14.4 generator were studied. All procedures were performed on therapeutic INR (2-3) with iv heparin administration to keep the ACT above 350 seconds. TCD was used to detect MESs in the middle cerebral arteries (MCA) in all patients. DW MRI scans were performed before and within 24 hours after the ablation to assess SCI in 33 of the 43 patients. MES data of 7 age and sex-matched patients who had undergone PVI using the same anticoagulation regime but the older version of the generator (GENius™ 14.3) in a previous study were used as a historical control for comparison. No clinical embolic event occurred in any of the patients. New SCI lesions were detected on DW MRI in 7 of 33 patients (21.2%). The mean total number of MES/MCA were 1090 SD:539 versus 2677 SD:902 using the modified versus the older version of the Genious generator (p=0.0003).

Conclusion: Modifications in power and temperature handling of the GENius™ generator resulted in a significant reduction of MES load during PVI. The incidence of SCI is also reduced when compared to the data reported previously.