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Neuropsychological Decline After Catheter Ablation of Atrial Fibrillation

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Schwarz N, Kuniss M, Nedelmann M et al. Neuropsychological decline after catheter ablation of atrial fibrillation. Heart Rhythm 2010;7:1761-1767.

Introduction

The article "Neuropsychological decline after cath- eter ablation of atrial fibrillation" by Schwarz et al. is the first publication that focused on cognitive side effects of elective circumferential pulmonary vein isolation (PVI).[1] Adverse neuropsychological changes after left atrial catheter ablation, as report- ed in this paper, were found in verbal memory and the result, conjoined with ischemic brain lesions, might represent cerebral side-effects of the ablation procedure.

Catheter ablation is recommended as a second-line therapy to treat recurrent symptomatic atrial fibrillation (AF) in patients who remain refractory to conventional antiarrhythmic therapy.[2] However, stroke, transient ischemic attacks (TIA) and other embolic events due to thrombogenicity of the pro- cedure are recognized side-effects during and af- ter left atrial catheter ablation.[3, 4] The incidence of stroke varies between less than 1% and 7%. [5] Ac- cording to a large multi-centre study, ischemic brain lesion (and myocardial damage) was the third most frequent cause of death, after cardiac tampon- ade - including irreversible pump-failure and atrio- esophageal fistulas .[6]

The underlying pathophysiology of neurologi- cal side-effects is most likely related to embolism. Thrombus formation during and after catheter ab- lation might result from platelet and coagulation system activation either directly at the catheter ma- terial or at the site of endothelial lesions that are caused by the ablation procedure.[7, 8] Transcranial Doppler monitoring indicated that several thou- sand micro-embolic signals (MES) can be detected within the basal cerebral arteries during the abla- tion process.[9] The microembolic load of patients undergoing AF ablation is therefore comparable to those subjected to major cardiac surgery (i.e. bypass surgery or valve replacement). Since cardiac sur gery can cause long-lasting neuropsychological changes and cerebral micro-embolism has been shown to play an important role in this context 10, it is assumable that left atrial ablation might lead to neuropsychological deficits similarly to major cardiac surgery.

In the study of Schwarz et al1 . [23] patients with re- current AF who underwent elective PVI were en- rolled. The primary endpoint was the neuropsy- chological outcome 3 months after intervention in contrast to the results of non-AF controls (n =23) without ablation and in covariance of baseline performance. Cerebral diffusion-weighted mag- netic resonance imaging (DWI) was performed in 21 AF-patients at baseline, 2-4 days and 3 months after intervention.

New ischemic brain lesions were detected in 3/21 patients (14.3%) on DWI shortly after the in-

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ter- vention. In one patient, a territorial middle cere- bral artery infarct occurred with severe clinical symptoms. This patient was excluded from cog- nitive follow-up assessment. The other two pa- tients presented small and clinically silent brain lesions. It is assumable that the small ischemic brain lesions, detected on DWI might represent the "tip of iceberg" only, and other micro-lesion were undetectable by state-of-the-art magnetic resonance imaging.

In contrast to the control group and in covariance of baseline performance, the ablation group showed worse neuropsychological outcome in verbal memory tests ($p<.001$). Overall 56.5% of ablation patients deteriorated (at least mildly) from their baseline values in verbal memory, as compared to 17.4% of controls. Most controls, however, showed improved performance in this memory test, due to practice effects.

The reported data are important, because they support the risk apprehension of catheter ablation of atrial fibrillation and identify a hitherto unknown neurological side-effect of this procedure. Although the memory deficits reported were not severe and did not appear to affect the activities of daily living in a significant manner, the adverse effect needs to be taken into account in the consideration of the pros and cons for PVI. Further studies with larger sample size, longer observation time and the inclusion of cogni- tive assessment, sensitive DWI and transcranial Doppler sonography (to detect cerebral micro- embolism) are required to determine an overall risk-benefit analysis of ablation and to better understand the underlying pathophysiology of side-effects.

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