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## Review article

# Asymptomatic damage of central nervous system defined by excess level of protein S100B by patients undergoing the radiofrequency ablation of ventricular tachycardia

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## ABSTRACT

**Aim:** Evaluation of the effect of radiofrequency catheter ablation of ventricular arrhythmias on asymptomatic central nervous system evaluation with the help S100B protein. Furthermore, identification of factors predicting elevation of S100B protein level after ablation.

**Methods:** Consecutive patients undergoing RFA for ventricular arrhythmias between 11/2015 and 8/2016. Protein S100B was evaluated before the procedure, immediately after the procedure, in 8 and 24 h after the procedure. In the case of the excess values of the S100B protein within 24 h after computer tomography (CT) of CNS supplementation and neurological examination.

**Set of patients:** 23 patients, of which there were 19 men and 4 women aged  $62 \pm 8$ . Coronary artery disease with a scar after myocardial infarction 18 patients (78%), 2 patients with dilated cardiomyopathy, 2 patients with idiopathic ventricular tachycardia, 1 patient with non-compact cardiomyopathy.

Eject fraction of left ventricle was  $29 \pm 8\%$ . All patients with implantable cardioverter defibrillator. 3 patients (13%) underwent RFA by combined endo-epicardial approach. By 5 patients (22%) the surgery was performed in general anesthesia.

**Results:** At least one excess value of S100B protein was identified by 10 patients (43%). After 24 h, the cut off value of the protein S100B was exceeded by 3 patients (13%). Even in one of these patients, we did not see acute changes on CT of CNS or by neurological examination. Surgery duration, ablation time, necessity for defibrillation during the surgery, intensity of anticoagulation during the surgery were without statistically significant influence on elevation of S100B protein levels.

A group of patients with S100B elevation had statistically significantly worse renal functions represented by serum creatinine level ( $127 \pm 41$  vs.  $100 \pm 25$   $\mu\text{mol/l}$ ,  $p = 0.02$ ). As another factor that statistically significantly predicted the postablation elevation of the protein S100B the stage of heart failure measured by the levels of NTproBNP (4417 vs 1634 ng/

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Abbreviations: AF, atrial fibrillation; CAD, coronary artery disease; CNS, central nervous system; CT, computer tomography; DCM, dilated cardiomyopathy; EF, eject fraction; ICD, implantable cardioverter defibrillator; LA, left atrial; LMWH, low molecular weight heparin; LV, left ventricle; LVNC, non-compact cardiomyopathy; MI, myocardial infarction; RFA, radiofrequency catheter ablation.

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l,  $p = 0.05$ ) was shown. A statistically significant effect on the elevation of S100B protein in our set was the use of total anesthesia with sevoflurane ( $p = 0.03$ ).

**Conclusion:** The elevation of the S100B protein after catheter ablation for ventricular arrhythmias is relatively common in our set. We did not identify any macroscopic changes on CT of CNS even by neurological examination.

The level of renal insufficiency, the progression of cardiac failure, and the use of inhaled anesthesia with sevoflurane correlate with the amount of S100B as the biomarker of asymptomatic disability of CNS by patients receiving radiofrequency catheter ablation for ventricular arrhythmias.

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## Introduction

RFA (radiofrequency catheter ablation) is one of the options for treating ventricular arrhythmias. Catheter ablation has a low risk of symptomatic cerebral ischemia. The modern imaging methods offer the possibility to diagnose even the “silent” asymptomatic lesions of central nervous system CNS [1,2]. The long-term consequences of these asymptomatic disorders are not known [3].

The use of nuclear magnetic resonance (NMR) of CNS is the standard by the identification of minimal or diffuse CNS lesions. However, it is impossible for patients with older (non-NMR-approved) ICD types. Computer tomography (CT) is not sensitive enough for very small or diffuse lesions.

Protein S100B is a tissue-specific for CNS [4–9]. The concentration of the S100B protein is 30–100 times higher in the brain than in other tissues [10]. Protein S100B is metabolized by the kidneys and excreted in the urine with a half-life of 2 h [9,11].

95% of healthy population have the values of the protein S100B in serum lower than  $0.1 \mu\text{g/l}$  (median  $0.04 \mu\text{g/l}$ ) [8]. Protein S100B has its relevance in complementary examinations in acute states and in neurology to determine prognosis after CNS injury [9].

In cardiology there were published some works evaluating the elevation of the S100B protein by patients after cardiac

arrest, after cardiac surgery in the extracorporeal circulation [12–21].

After ICD implantation, Dworschak et al. evaluated the elevation of the S100B protein in relation to ICD proofing [22]. An increase of the S100B level was related to the total time of circulation arrest. 64% of the patients observed in this study had neurocognitive deficits assessed as learning disorder, memory impairment, attention deficit disorder.

Šramko and colleagues observed 58 patients after RFA for atrial fibrillation (AF). Elevation of the S100B protein was seen by 3 patients (5%), one patient with finding of the CNS correlation on NMR. Excess values of the S100 B protein were found by patients with persistent atrial fibrillation AF, increased LA, longer procedural time, higher dose of ablation energy, and a lower cumulative dose of heparin [3].

The aim of the work is to evaluate the incidence of asymptomatic ischemia of CNS in the cohort of patients undergoing the ablation of ventricular arrhythmias in the left or both heart ventricles.

## Methods

We were monitoring consecutively 23 patients who underwent the radiofrequency catheterization ablation of ventricular arrhythmias in the right or left ventricle from 11/2015 to 8/2016 at our workplace. Protein S100B was evaluated before the

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