lek. Patrycja Stępniak

Ocena zależności pomiędzy rzutem serca a parametrami pracy implantowanego układu do elektroterapii serca

Rozprawa na stopień doktora nauk medycznych i nauk o zdrowiu

w dyscyplinie nauki medyczne

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STRESZCZENIE PRACY W JĘZYKU ANGIELSKIM / ENGLISH SUMMARY

Title: Evaluation of the relationship between cardiac output and performance parameters of an implanted cardiac electrotherapy system .

Introduction: The optimal setting of operating parameters for electrotherapy devices is clinically important. One of the most important parameters for dual-chamber pacemakers is the atrioventricular delay (AV delay). Optimization of this parameter has been a frequently discussed topic in clinical trials. Researchers have so far used various methods to find the simplest and most accurate way to optimize it. Due to the increasing average age of life and the increasing population of patients with implanted pacemakers, it seems important to expand these studies to find a simple and non-invasive method to select the correct value of this variable.

The aim of the study was to: 1) evaluation of the effect of programmed AVD value (and Am-Vp parameter in a patient with Micra AV pacemaker) on cardiac index; 2) evaluation of the relationship between pacing mode and cardiac index; 3) evaluation of clinical effects loads on cardiac index; 4) evaluation of the effect of; 4) attempt at optimization electrotherapy device settings under the control of hemodynamic parameters.

Material and methods: The study included 76 patients (34 men and 42 women) with implanted Biotronik dual-chamber pacing systems who are under permanent care of the Outpateint Telemedicine and Control of Implanted Heart Devices of the 1st Department of Cardiology University Clinical Center of Warsaw Medical University (UCK WUM). In addition, a pilot measurement was also performed in one patient with an implanted MICRA AV device. Measurements were performed in real time, after in-depth interview

concerning the existing internal medicine burdens and the applied pharmacotherapy. A continuous noninvasive blood pressure (CNAP) monitor was used to assess hemodynamic parameters. All patients gave consent and tolerated the study protocol well.

Results: The mean age of the study population was 77.98 ± 10.28 years. Overweight or obesity was common in the study population (mean BMI 28.7 kg/m^2). All patients were under pharmacotherapy for at least one of the following chronic diseases: dyslipidemia (82%; n=62), hypertension (89%; n=68), diabetes (37%; n=28) and chronic heart failure (29%, n=22). Due to the above mentioned burdens 72% (n=55) of the subjects were taking beta-blocker, 57% (n=43) angiotensin converting enzyme inhibitor, 46% (n=35), calcium channel blocker and 64% (n=49) diuretic. In addition, the majority i.e. 80% (n=61) of patients were undergoing hypolipemic treatment with statin. The primary indications for pacemaker implantation in the study population were grade III atrioventricular block (25%, n=19), grade II atrioventricular block (23.7%, n=18), sick sinus syndrome (43.4%, n=33), symptomatic bradycardia (6.6%, n=5) and vasovagal syndrome (1.3%, n=1). Analysis of the results obtained showed that in the study population, the baseline own cardiac index (in the absence of stimulation) was reduced and was 2.15 ± 1.14 ml/m^2. It was also found that gender, age (> or <75 years), body mass index (BMI), beta-blocker therapy, and positive history of chronic heart failure had no effect on indexed cardiac output in the study population. Furthermore, when changing pacing parameters in dual-chamber pacing (DDD mode), statistical significance was demonstrated when shortening the atrioventricular delay by up to 30 ms from the patient's own AV conduction time. Further shortening of AV delay did not translate into statistically significant changes in cardiac index. Additionally, AV delays programmed between 20-80 ms were found to be significantly worse compared with AV delays >80ms. The study did not confirm that single-chamber ventricular pacing significantly worsens the cardiac index compared to the patient's own atrioventricular

conduction. Regarding the measurements performed in a patient with a Micra AV pacemaker, an adverse effect of prolongation of the Am-Vp parameter on cardiac index was demonstrated. At the same time, it was found that in both VVI and VDD pacing, acceleration of the heart rate caused an increase in the cardiac index.

Conclusions: /1/ Baseline cardiac index was reduced in the evaluated patient population. /2/ Gender, age, body mass index, internal medicine burdens, and pharmacotherapy used had no significant effect on cardiac index. /3/ Atrioventricular pacing with programmed short AVD was significantly worse. /4/ Single-chamber ventricular pacing does not significantly affect the decrease in cardiac index compared with its own AV conduction. /5/ Am-Vp prolongation in patients with MICRA AV pacemaker adversely affected the cardiac index.

Keywords: atrioventricular delay, cardiac output, cardiac index, non-invasive methods of measuring cardiac output, dual-chamber pacemaker.