

A Novel Amiodarone-Eluting Biological Glue for The Prevention of Postoperative Atrial Fibrillation

Beckerman, Ziv¹; Azran, Adi²; Kimhi, Ohad²; Cohen, Oved¹; Shani, Liran¹; Nir, Roni-Reuven¹; Bolotin, Gil¹

¹Rambam Medical Campus, Cardiac Surgery, Haifa, Israel; ²Technion, Biochemistry, Haifa, Israel

Background: Postoperative atrial fibrillation (POAF) is the most common complication after cardiac surgery, leading to increased morbidity and mortality. Routine prophylactic use of amiodarone is efficient but not recommended due to associated systemic adverse effects. The aim of this study was to evaluate the efficacy of a novel local drug delivery system for the prevention of POAF, while avoiding systemic distribution.

Methods: Nine goats (5 study goats, 4 controls) underwent left thoracotomy and right atrial epicardial electrodes attachment. An alginate based novel proprietary glue with amiodarone (1 mg/kg bw) was applied to the right atrial epicardium of the study group. In the control group glue without amiodarone was applied. Atrial effective refractory period (AERP), and atrial response to burst pacing (rapid atrial response, RAR) were assessed at the following intervals: before and after application, and in the first, second and third postoperative days (PODs).

Myocardial, plasma and extracardiac tissue amiodarone concentrations were analyzed by high-performance liquid chromatography (HPLC).

Results: Mean HPLC drug levels were found to be within the therapeutic window in the right atrium of all tested animals from the first POD (23510.86 ± 5230.69 ng/g). Amiodarone concentrations were negligible in both ventricles. Amiodarone concentrations in plasma, skeletal muscle, and thyroid gland were below detection level. AERP did not change in both groups during the study. Baseline RAR inducibility was comparable between both groups ($P=0.27$). Within the study group, a significant reduction in RAR inducibility was observed on POD3 (65% vs. 27%; $P=0.019$). No such differences were found among the control group (44% vs. 41%; $P=0.86$).

Conclusions: The local delivery of amiodarone reduced atrial vulnerability to tachyarrhythmias, while extracardiac drug levels remained below detection. This novel technology should be further validated for the prevention of POAF.