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Extrapericardial placement of implantable cardioverter-defibrillator leads: A novel technique for cardiac anti-arrhythmic therapy

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Introduction: Transvenous pacing leads insertion provides good long-term results for implantable cardioverter-defibrillator (ICD). However many factors like venous occlusion, intracardiac shunting, previous surgery or risk of extraction may prohibit or complicate transvenous ICD lead placement. The indications for non-traditional placement of ICD leads have greatly expanded over the past decade especially with the growing population of Adult Congenital patients.

Aim: The aim of this study was to evaluate the impact of extrapericardial placement of ICD leads for treating ventricular arrhythmia via AntiTachycardia Pacing (ATP) and/or Defibrillation.

Methods: In vivo studies were performed in 9 female Yorkshire pigs (weight 46.2 ± 6.1 kg). Surgical approach via left mini-thoracotomy was done. The first custom-made bipolar pacing lead was sutured extrapericardially at the level of the lateral wall of the left ventricle (LV) and the second lead was secured in a similar fashion at the level of the basal aspect of the right ventricle without opening the pericardium. The ICD generator was placed into the chest wall. A standard "Shock on T" pacing scheme induced ventricular fibrillation (VF).

Results: All ICD systems had acceptable defibrillation thresholds with energy tested at 21J, 29J, 37J x 5. There was no increase in impedance between the coil and generator. There were no inappropriate discharges. Each successful shock converted VF to normal sinus rhythm. The mean R-wave amplitude was $9\text{mV} \pm 4\text{mV}$. The mean pacing impedance was 331 Ohms. The mean threshold was $4.8\text{V} @ 1.5\text{ms}$.

Conclusion: Extrapericardial placement of ICD leads has demonstrated good performance with stable defibrillator parameter. It appears to be a simple efficacious technique to ICD therapy and in some clinical situations can overcome limitations of transvenous or epicardial approaches as well as provide the ability to deliver ATP which is in stark contrast to currently available technology.

Biography

Jeko Metodiev Madjarov is the Adjunct Assistant Professor, University of North Carolina. He is board-certified in general, vascular/endovascular, and cardiothoracic surgery. His clinical interests include adult cardiac and thoracic surgery; aortic surgery, including complex/endovascular aortic repair; and minimally invasive coronary and thoracic surgery. He has received his medical degree summa cum laude from Sofia Medical University, Bulgaria and completed a cardiac surgery residency at St. Ekaterina University Hospital, Sofia, Bulgaria. In the US, he completed general surgery residencies at Yale-New Haven Hospital, New Haven, CT; and Baystate Medical Center/Tufts University School of Medicine, Springfield, MA. He then completed fellowships in vascular/endovascular surgery and cardiovascular/thoracic surgery at Carolinas Medical Center, Charlotte, NC-under Prof. Francis Robicsek.

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