

## Unfavourable outcome after the upgrade of an implantable cardioverter defibrillator to cardiac resynchronization therapy

### Authors:

A. Kiss<sup>1</sup>, G. Sandorfi<sup>1</sup>, I. Edes<sup>1</sup>, Z. Csanadi<sup>1</sup>, M. Clemens<sup>1</sup>, <sup>1</sup>University of Debrecen, MHSC-Faculty of Medicine, Institute of Cardiology - Debrecen - Hungary,

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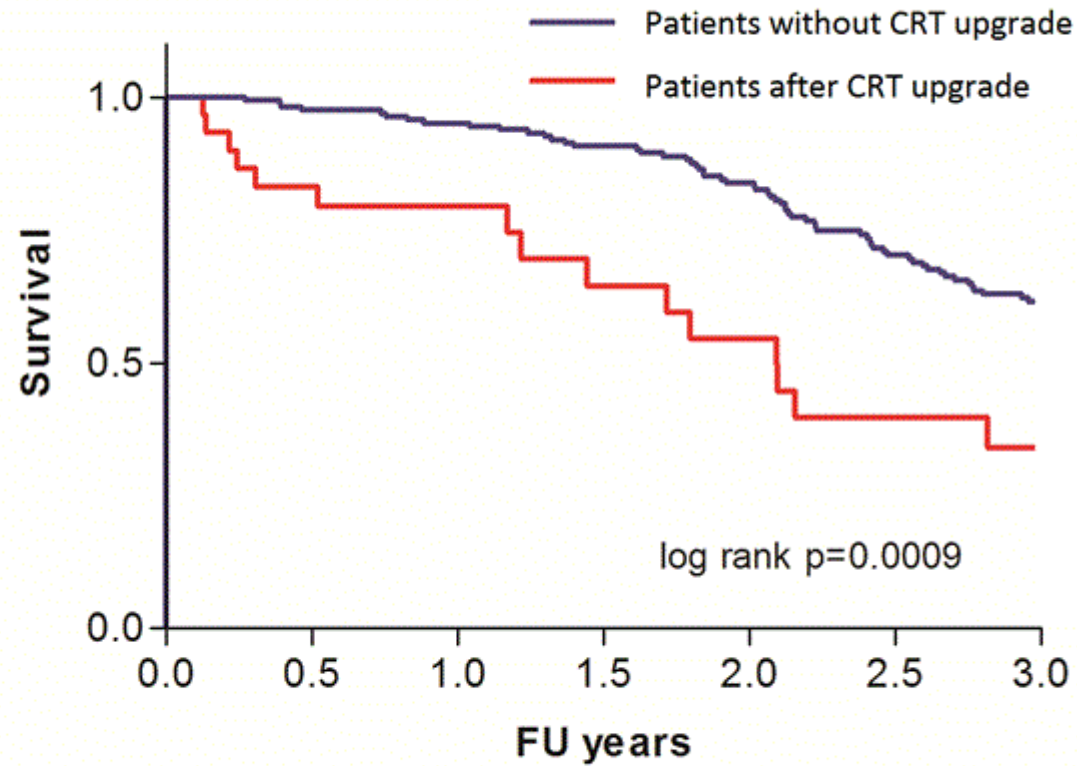
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**Background:** Cardiac resynchronization therapy (CRT) improves survival in selected patients with heart failure (HF). As the potential survival benefit of CRT performed as an upgrade from a previously implanted cardioverter defibrillator (ICD) has not been explored, we evaluated total mortality after CRT upgrade in this context.

**Methods and results:** A total of 31 patients (27 male, mean age:63.7±9.6years) with structural heart disease underwent CRT device implantation as an upgrade of a previously implanted single or dual chamber ICD between 2004 and 2015 at our Institute. The indication for ICD implantation was prophylactic based on the MADIT II or SCD-HeFT criteria (in 13 patients) or secondary prevention after a sustained ventricular arrhythmia (in 18 patients). Mean left ventricular ejection fraction (LVEF) was 29.9±7.8% and mean NYHA status was 2.4±0.8 at the time of ICD implantation. No indication for CRT was present in any of these patients at the time of ICD implantation. CRT upgrade was performed after a mean follow-up of 3.9±2.9 years based on the following indications: widening of the QRS complex (from 108±20 to 158±24msec.) in 24, decreasing LVEF (from 41.5±2.1 to 26.5±2.1%) in the presence of LBBB in 2, and an increase in the need for right ventricular stimulation (burden >40%) in 5 patients. A significant reduction in the QRS width after CRT upgrade (from 160.3±26 to 130.3±23msec., p<0.001), an improvement in NYHA class (from 3.1±0.8 to 2.5±1.0, p=0.16) and an increase in the mean LVEF (from 27.6 to 33.3%, p=0.049) was observed including 4 patients (13%) who demonstrated an increase in LVEF above 10% at the 1-year follow-up. 17/31 patients (55%) died during a mean follow-up of 19.0±16.6 months after CRT upgrade. No statistically significant prognostic factor of survival was found among the patients' baseline data by using the Cox proportional hazard model. Mortality rate in the control group (44/167; 26.4%) was significantly lower (log rank p=0.0009) during a similar follow-up period (Figure).

**Conclusion:** Despite a marked reduction in QRS width and a modest improvement in LV EF, mortality remains high after CRT upgrade in this patient cohort. This would argue for an earlier administration of alternative treatment modalities (assist device, heart transplantation) in HF

patients who demonstrate QRS widening, a significant decrease in the LV EF or a need for ventricular stimulation.



Pts after CRT upgrade	31	15	11	6
Pts without CRT upgrade	167	154	132	89