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# Causes of death after Micra™ leadless cardiac pacemaker implantation: a single centre, long-term experience

Maier Julian[1,2], Blessberger Hermann[1], Bötscher Jakob[1], Ebner Jakob[1], Saleh Karim[1], Schwarz Stefan[1], Rechberger Stefan, Fellner Alexander[1], Lambert Thomas[1], Steinwender Clemens[1], Kiblböck Daniel[1]

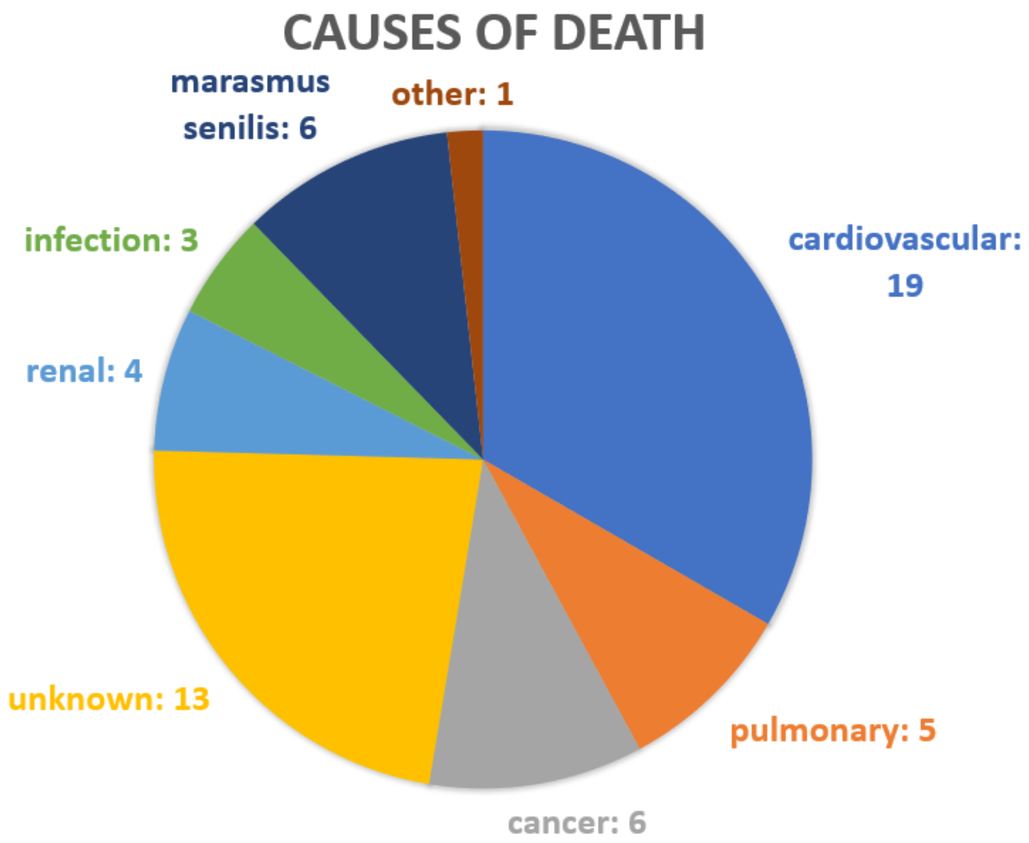
**1** Department of Cardiology, Kepler University Hospital, Medical Faculty, Johannes Kepler University, Linz, Austria **2** Institute of Pharmacology, Center for Physiology and Pharmacology, Medical University of Vienna, Vienna, Austria

## Objective

Due to the decreased complication rate compared to conventional cardiac pacemaker implantation, leadless cardiac pacemakers (LCP) have become an important clinical alternative during the last decade. Long-term follow-up data of Micra™ LCPs revealed high success and low peri-procedural complication rates. This study aims to investigate and describe the major causes of death in a long-term follow-up cohort of patients who received a Micra™ pacemaker.

## Patients and Methods

283 patients who received a Micra™ LCP at our department, between 12/2013 and 07/2020, were included in this retrospective data analysis. Follow-up was conducted 3- and 12-months post-implant and yearly afterwards. Patients were grouped in alive and deceased. For categorical variables, group comparisons were conducted Pearson's chi-square test. Continuous variables were compared with the Mann-Whitney U test. During a median follow-up of 25 (13.25-47.00) months, 60 (21.20%) patients died. The median time to death was 19.50 (11.25-35.00) months.




## Results

While deceased patients were on average older than alive patients, the difference was not statistically significant (84.00 years [77.25-87.00] vs. 79.00 [76.00-84.00], p=0.09). 19 (31.67%) of the deceased died due to a cardiovascular event (12 due to heart failure, 2 to myocardial infarction, 5 to cardio-respiratory failure). 6 (10%) succumbed to cancer and another 6 patients died due to marasmus senilis. 4 (6.67%) patients' cause of death was renal failure. 5 (8.33%) died to pulmonary geneses, 3 (5%) to neurological events or infections, respectively. One died of trauma and for 13 (21.67%) patients the cause of death could not be determined.

The deceased cohort suffered more frequently from atrial fibrillation at the time of the index procedure (p=0.025). In addition, patients who later died had a prolonged length of hospital stay compared to the other group (median 3.00 [2.00-5.75] vs. 2.00 [1.00-4.00] days, p=0.006). Deceased patients had a significantly decreased ejection fraction (55.00 [50.00-60.00] vs. 60.00% [55.00-65.00], p=0.005), a higher incidence of coronary artery disease (46.67% vs. 30.49%, p=0.019) and increased NT-pro BNP concentrations (3950.50 [1146.75-5307.75] vs. 1093.00 pg/ml [545.00-2613.50], p<0.001). In addition, the renal function of patients who died was significantly worse (p<0.001). No significant group differences were found concerning the rate of complications and device related parameters.

## Conclusion

The main causes of death after Micra™ implantation in our cohort were of cardiovascular geneses unrelated to periprocedural events, followed by cancer and marasmus senilis. This distribution appears to be in line with the main causes of death of the elderly in general, who constitute the main patient population receiving an LCP.

julian.maier@meduniwien.ac.at