Background: Compared to the natural electrical activation of the myocardium through the His-Purkinje system, right ventricular pacing is associated with prolonged QRS complex duration, thereby impeding synchronicity of contractions. In left ventricular pacing, higher pacing voltage decreases QRS complex duration. The aim of our study was to describe the relation between right ventricular pacing voltage and the QRS complex duration.
Methods: 14 patients (73.6±7.6 years) with AV block and implanted pacemakers were paced at a frequency of 100 bpm with various pacing voltages and a surface vectorcardiographic ECG was recorded. A signal-averaged QRS vector length was calculated at each degree of pacing voltage. The changes in the QRS complex duration were measured as a relative shift of the terminal region of the vectorcardiographic QRS complex (end-shift) and its most prominent peak (peak-shift) using the cross-correlation method.
Results: The nonlinear relationship between stimulation voltage and QRS duration was observed with the highest impact of stimulation voltage changes near the threshold value. The 4-fold increase in the stimulation voltage above the threshold caused a QRS complex shortening by 3.7±2.1 ms (range 0.19-7.76 ms). Similar peak- and end-shift responses to altered stimulation energy demonstrated that the acceleration of depolarization occurred in the initial portion of the QRS complex. Older electrodes exhibited smaller and more linear changes in the QRS complex duration than newer electrodes.
Conclusions: The QRS complex duration decreases with an increase in right ventricular stimulation voltage in a nonlinear fashion with a higher influence of increase in stimulation voltage just above the threshold.