Atrial lead location plays an important role to avoid unnecessary ventricular pacing not only during atrial pacing but also during atrial sensing

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Introduction: It is important to avoid unnecessary ventricular pacing (VP) to prevent adverse cardiac events in patients undergoing pacemaker implantation. However, right atrial (RA) pacing sometimes causes prolongation of PQ interval leading to increase of VP frequency. The purpose of this study was to determine if there was any favorable atrial lead location to avoid VP.

Methods: This study included 12 patients who had sinus rhythm and spontaneous atrio-ventricular conduction, and undergoing pacemaker implantation or electrophysiological study (8 males, mean age 52.8 +/- 22.1 years). Ventricular lead was placed in right ventricular (RV) apex or septum, and RA lead was placed in RA appendage (RAA), high RA septum (HAS) and low RA septum (LAS) in series in each patient. The following parameters were obtained from ECG and compared according to 3 atrial lead locations: P width, interval from atrial pacing (AP) spike to QRS, interval from AP spike to onset of P wave, and the shortest AV delay which enables avoidance of VP (Non-VP AVD) during AP, interval from onset of P wave to local A wave, and Non-VP AVD during atrial sensing (AS).

Result: During AP, interval from AP to QRS (180.8 +/- 29.9 vs 164 +/- 29.6 vs 143.8 +/- 36.2 ms, p<0.05) and Non-VP AVD (217.5 +/- 35.9 vs 195 +/- 31.1 vs 175 +/- 49.3 ms, p<0.05) were shortest during LAS pacing while P width and interval from AP to onset of P wave were not different (p=NS). During AS, LAS lead location resulted in the longest interval from onset of P wave to local A wave (-0.8 +/- 11.1 vs 7.5 +/- 8.7 vs 30.5 +/- 11.4 ms, p<0.05) and the shortest Non-VP AVD (180 +/- 35.6 vs 190 +/- 36.5 vs 147.5 +/- 38.6 ms, p<0.05).

Conclusion: LAS lead location resulted in shortest Non-VP AVD primarily due to shortening of PQ interval during AP, and due to prolongation of the interval from onset of P wave to atrial sensing during AS. LAS atrial lead positioning seems to be most favorable in terms of avoidance of unnecessary ventricular pacing under the presence of spontaneous atrio-ventricular conduction.