

Seminar Title:

“Longer Lasting Torsade de Pointes Arrhythmias Require Reentry for its Maintenance in the CAVB Dog Model”

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ABSTRACT

The mechanism of Torsade de Pointes arrhythmias (TdP) has been under debate for many years. Focal activity as well as reentry have both been mentioned in the initiation as perpetuation of TdP. Therefore, the arrhythmogenic mechanisms responsible for TdP were once more investigated in the CAVB dog model, known for its high susceptibility for TdP.

In five TdP-sensitive CAVB dogs, 56 needle electrodes were evenly distributed transmurally to record 240 unipolar local electrograms simultaneously. Non-terminating (NT) episodes were defibrillated after 10s. Software was developed to automatically detect activation times and to create 3D visualisations of the arrhythmia. For each episode of ectopic activity (ranging from 2 beats to NT episodes), this novel methodology was applied to 1) create directed graphs of the wave propagation and 2) detect reentry-loops by using an iterative depth-first-search algorithm.

Depending on the “TdP” definition (number of consecutive ectopic beats), we analyzed 32-54 TdPs: 32 were longer than ≥ 5 beats. In the total group, 9 were NT and 45 were self-terminating. Initiation and termination was always based upon focal activity. Reentry becomes more important in the longerlasting episodes (≥ 14 beats), whereas in all NT TdPs, reentry was the last active mechanism. During reentry, excitation fronts were constantly present in the heart, while during focal TdPs there was always a silent interval between 2 consecutive waves (142 ms) during which excitation fronts were absent. Interbeat intervals were significantly smaller for reentry-episodes 220 vs 310* ms in focal. Electrograms recorded in particular areas during NT TdP episodes had significantly smaller amplitude (0.38 mV) than during focal episodes (0.59 mV*).

Conclusions: TdP can be driven by focal activity as well as by reentry depending on the duration of the episode. Non-terminating episodes are always maintained by reentry, which can be identified by shorter interbeat intervals and smaller amplitude.