Assessing pulse pressure variation (PPV) in patients with atrial fibrillation.

2. The effect of mechanical ventilation

Background and Goal of Study: The observed beat-to-beat PPVs in patients with atrial fibrillation are the resultant of 2 superimposed effects: heart rhythm and mechanical ventilation (MV). We previously studied a model to predict the PP of an irregular beat during apnea. We now assess the impact of MV by measuring the deviations from this model during ventilation with low and high tidal volume.

Materials and Methods: After ethical approval and informed consent, patients, with AF scheduled for an ablation of the pulmonary veins under general anesthesia, were included. ECG and invasive arterial waveforms were simultaneously recorded during 60 sec with 3 different MV modes: T1: Apnea. T2: 12 x 8ml/kg and T3: 8x12ml/kg.

The analysis of the data of each patient followed a 2-step procedure. (see fig1)

-Step 1: Building an apneic prediction surface (APS).

For each beat of T1, the length of the two preceding RR intervals (RR0, RR-1) were used to construct an individual prediction model for PP of that beat, using Local Polynomial Regression Fitting.

-Step 2: Assessing deviations from APS during MV.

For every patient, the difference between the measured and the predicted PP values, based on the APS were calculated for T1, T2 and T3. The mean of these differences was used as a measure for the global deviation from the APS.

Results and Discussion: 7 patients were included. The mean number of data points to determine an individual APS was 79 (SD=17).

Repeated measures ANOVA revealed a significant difference of the mean deviations from the APS between the different MV modes. (p = 0.0002). The means (SD) of the global deviations were 0(0)mmHg, -7(4) mmHg and -10(6) mmHg for T1, T2 and T3. (see fig 2)

Conclusion: The concept of using an APS based on the two preceding RR intervals can provide a basis to assess the effect size of MV induced variations of pulse pressure in patients with AF.