Author’s response to reviews

Title: Non-invasive evaluation of ventricular refractoriness and its dispersion during ventricular fibrillation in patients with implantable cardioverter defibrillator

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Reviewer 1 (Steen Pehrson)
Detailed comments in the methods section as well as in the discussion concerning
1) What area of the left ventricle does the recording most probably represent? Epicardial and/or endocardial?
As mentioned in the manuscript we believe it is the posterior part of the left ventricle that mainly contributed to the bipolar electrograms recorded from the lower part of the oesophagus, with epicardial part contributed more than the endocardial part, since the electrodes were near the former than the latter. However, the available data from this study does not allow verification of the origin of the electrograms.
2) What are the reported distances between the electrode and the posterior part of the left ventricle?
As the reviewer suggested, relevant changes have been added in the discussion (page 7, last 2 lines and page 8, line 1).
3) The electrogram have a more far-field appearance than the recordings from the RV electrode in Figure 1 should be commented.
Due to the fact that the oesophageal electrodes had no direct contact with the left ventricular myocardium, the amplitude of the electrograms recorded from the oesophagus are lower than those from the RV apex. However, the distinctly sharp and rapid deflections suggest they are mainly local electrical activities. As the reviewer suggested, comments have been added in the discussion (page 8, line 2-5).
4) Was the position of the electrode verified by fluoroscopy?
Yes. Added in the methods, page 4, line 12.
5) The local activation times from the QRS onset to the LV-eso (and RV-apex) might also be of interest.
Yes, it is of interesting. However, during VF data on local activation times were not available, while during sinus rhythm they were out of the scope of this paper.

Reviewer 2 (Pascal van Dessel)
1) Concerning golden standard of estimating myocardial refractory from VF interval measurement and whether patients with less damaged heart has less dispersion, etc.
We agree with the reviewer that whether the 10th percentile VF intervals are the most suitable parameter to estimate the refractoriness is not verified.
We measured the shortest, 10th percentile, mean and median VF intervals as did in previous published studies. As mentioned in the manuscript, the VF interval measurement method itself is
based on the theory that during multiple wavelet reentry, cells are re-excited as soon as they have regained their excitability. Therefore, the shortest intervals during VF could be estimates of myocardial refractoriness. We took the 10th percentile VF interval, which represents the shortest interval group rather than the shortest interval since that is a single extreme value and thereby easily influenced by measurement errors.

The patient population in this study is very small and therefore the reviewer’s question on whether patients with less damaged heart have less dispersion could not be answered. However, we may bear this interesting issue in mind in our later observations.

2) What was the correlation measured between the VERPs measured during SR in RVOT and RV apex and the median, mean shortest and 10th percentile of VF intervals?

As presented in the section of Results, the VERPs measured during sinus rhythm were significantly longer than the estimated VERPs. However, there was no clear correlation between them. We cannot exclude the possibility that this may related to few measurements, i.e., this was done in only 6 of the 11 patients.

3) Part of the recordings in which the local activation could not be indicated was omitted from analysis. How often did this happen? Was this especially when very short VF intervals were present?

During the measurement of VF intervals, sometimes low amplitude, fragmented and/or continuous electrical activities appeared where the local activation was difficult to define. To ensure an accurate measurement, the intervals before and after were omitted from analysis. This happened at an average of 2 occasions/patient (ranged 1-4). However, the omitted intervals were not necessarily very short intervals. As the reviewer suggested, this has been added in the sections of Methods (page 5, line 7-9) and Results (page 6, line 4-6).

4) English grammar corrections.

Yes. Done!