

A NEW METHOD FOR DETECTING LATE POTENTIALS USING MULTICHANNEL ECGS

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Abstract—We developed a procedure that is able to detect, quantify and localize late potentials that will also be applicable to patients with abnormally wide QRS complexes.

INTRODUCTION

Late potentials are low amplitude signals at the end of the QRS-complex. The standard criteria are only able to distinguish between patients with a high and with a low risk for fatal arrhythmic events using a statistical relation with the QRS duration, the RMS value of the last 40 ms, and the duration of low amplitude signals[1], [2]. It is, however, not possible to quantify the risk, nor is it possible to indicate the region of the heart where the late potentials originate. Moreover, the criteria are not applicable to patients with bundle branch block, paced QRS complexes, or otherwise wider QRS complexes.

METHODS

Sixty-two channel ECG data were recorded simultaneously from 17 patients with prior myocardial infarction and four patients with structurally normal hearts. For all channels the ECG was signal averaged and high pass filtered at 40 Hz. For all recordings also the Frank leads were computed and the standard criteria were used to identify the QRS offset and the LAS40 interval [2]. The LAS40 interval starts at the LAS40 point, the time instant where the vector magnitude of the X, Y and Z leads drops below the 40 μ V threshold for the last time.

RESULTS

High pass filtered ECG tracings of the terminal part of the QRS and the initial part of the ST-T segment behave qualitatively different for patients with and without late potentials. In figure 1 two ECG tracings for two patients are shown starting from the LAS40 point to 60 ms later. The patients without late potentials have tracings that from the LAS40 point decay quickly towards zero, see figure 1b, whereas the patients with late potentials show activities that go on for much longer, figure 1c. Moreover, the signals have the largest amplitude on the surface directly overlying the lateral posterior infarcted area.

CONCLUSIONS

By investigating a 50 ms part of the ECG just after the end of depolarization of the healthy myocardium, i.e. 10–20 ms after the LAS40 point, it is possible to discriminate patients with and without late potentials. This criterion does not depend on the QRS duration and should therefore also be applicable to patients with wide QRS complexes. This method is also able to indicate the area in the heart where the late potentials originate.

REFERENCES

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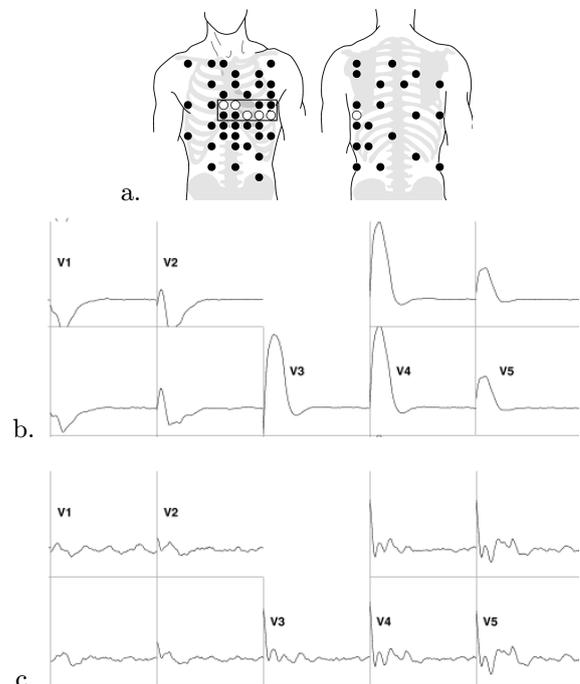


Figure 1. a. Positions of the 62 electrodes. Standard leads V1–V6 are marked with open circles. b, c. A subset of the 62 ECGs, indicated by the small rectangle in panel a, for one patient without (panel b) and one with late potentials (panel c). All leads were averaged and filtered. An interval of 60 ms is shown starting at the LAS40 point. Vertical scale is 200 μ V.