How many parameters of P-wave signal-averaged ECG are optimal for discrimination of patients with paroxysmal atrial fibrillation

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Abstract: Our earlier experiences indicate that parameters which describe the P-wave signal-averaged ECG (SAECG) after filtration have great statistical fluctuation so discrimination of patients (pts) with ischemic heart disease and paroxysmal atrial fibrillation (PAF+ - group 1) and pts without paroxysmal atrial fibrillation (PAF_ - group 2) and healthy subjects without heart disease (group 3) is very difficult to obtain. We have introduced new parameters to describe the shape of filtered P-wave SAECG and enlarged their number up to 14.

INTRODUCTION

Our earlier experiences indicate that parameters which describe the P-wave signal-averaged ECG (SAECG) after filtration have great statistical fluctuation so discrimination of patients (pts) with ischemic heart disease and paroxysmal atrial fibrillation (PAF+ - group 1) and pts without paroxysmal atrial fibrillation (PAF_ - group 2) and healthy subjects without heart disease (group 3) is very difficult to obtain.

MATERIAL AND METHOD

High resolution ECG was recorded from orthogonal Frank leads (X,Y,Z). Averaging was made for 150-200 beats. The gain of the amplifier was 5000 and the noise input was <0.6μV. Ventricular ectopic beats and gross noise were eliminated by conventional QRS template-matching program before proceeding to the P-wave recording. We have introduced new parameters to describe the shape of filtered P-wave SAECG and enlarged their number up to 14.

There are:

1. RMS 20 - Root Mean Square (RMS) voltages for last 20 ms;
2. RMS 30 - RMS voltages for last 30 ms;
3. sRMS 20 - RMS voltages for first 20 ms;
4. sRMS 30 - RMS voltages for first 30 ms;
5. RMS4/RMS - RMS voltages for the last quarter of P-wave divided by RMS voltages of full time of P-wave;
6. hfP - time duration of filtered P-wave;
7. PQ seg - time duration of PQ segment;
8. sLAS 3 - time duration where temporary amplitude of filtered P-wave was below 3 μV (from the beginning of P-wave);
9. sLAS 5 - time duration where temporary amplitude of filtered P-wave was below 5 μV (from the beginning of P-wave);
10. LAS 3 - time duration where temporary amplitude of filtered P-wave was below 3 μV (from the end of P-wave);
11. LAS 5 - time duration where temporary amplitude of filtered P-wave was below 5μV (from the end of P-wave);
12. Env. 10 - envelope of the last 10 ms of filtered P-wave;
13. Env. 20 - envelope of the last 20 ms of filtered P-wave;
14. Env. 30 - envelope of the last 30 ms of filtered P-wave.

By application of earlier described Multiparametric Method (MPM) we calculated the probability of belonging of each patient to adequate group. We have made verification by using different number of parameters.

DISCUSSION

During this study we have introduced new parameters to describe the shape of filtered P-wave SAECG . The results for enlarged number of parameters show that for 7 parameters it is possible to recessive about 90% of right decision. This study must be continued for better description of relation between new parameters and identification of patients, to find the best combination of calculating parameters. This results must be also verified for more patients.

CONCLUSION

We have founded that if the number of parameters is greater than 7, in this case the percent of right decision about belonging to suitable group is greater than 90% and we find also the good differentiation between groups.

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