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ORIGINAL ARTICLE

QRS complex widening as a predictor of appropriate implantable cardioverter-defibrillator (ICD) therapy and higher mortality risk in primary prevention ICD patients

Aleksander Maciąg[1], Andrzej Przybylski[2], Maciej Sterliński[1], Michał Lewandowski[1], Katarzyna Gepner[1], Ilona Kowalik[1], Paweł Derejko[2], Mariusz Pytkowski[1], Łukasz Szumowski[2], Hanna Szwed[1]

[1]2nd Coronary Artery Disease, Institute of Cardiology, Warsaw, Poland
[2]Department of Arrhythmia, Institute of Cardiology, Warsaw, Poland

Abstract

Background and aim: Effectiveness of implantable cardioverter-defibrillators (ICD) in patients with reduced left ventricular ejection fraction after myocardial infarction has been documented in large randomised trials. We analysed the predictive value of clinical factors at the time of implantation for adequate ICD interventions and mortality risk.

Methods: We analysed 121 consecutive patients (15 women, 106 [88%] men; mean age 62 ± 10 years) with coronary artery disease in whom ICD was implanted for primary prevention between 2001 and 2007. Mean duration of follow-up was 876 ± 538 days.

Results: Forty-four (36.4%) patients had adequate ICD interventions. In the Cox analysis, wider QRS complexes (hazard ration [HR] per each 10 ms increment: 1.13, confidence interval [CI] 1.039–1.229, p = 0.0045) and younger age at the time of ICD implantation (HR per each 10 year increment: 0.7, CI 0.5–0.9, p = 0.0081) were associated with a higher probability of adequate intervention. Wider QRS complexes were associated with a higher probability of electrical storm (HR 1.059, CI 1.014–1.045, p = 0.0002). During follow-up, 21 (17.4%) patients died. In the Cox analysis, wider QRS complexes (HR per each 10 ms increment: 1.123, CI 1.011–1.248, p = 0.0306 [in univariate analysis only]), older age at the time of implantation (HR per each 10 year increment: 1.7, CI 1.1–2.8, p = 0.0396) and higher NYHA class (HR 4.4, CI 1.7–11.5, p = 0.0022) were associated with increased mortality. Mortality was reduced by previous revascularisation (HR 0.3, CI 0.1–0.7, p = 0.006).

Conclusions: Patients with wider QRS complexes at the time of ICD implantation had a higher probability of adequate device intervention and mortality risk. QRS complex widening was also associated with a higher incidence of electrical storm.

Key words: QRS widening, adequate ICD interventions, mortality risk

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INTRODUCTION

Malignant ventricular arrhythmias are the most common cause of sudden cardiac death (SCD) in patients with coronary artery disease (CAD). The MADIT II and SCD-HeFT trials confirmed effectiveness of implantable cardioverter-defibrillators (ICD) in the primary prevention of SCD [1, 2]. These studies have resulted in a rapidly growing number of ICD implantations. On the other hand, expanded criteria for ICD implantation, including patients with both high and moderate SCD risk, also lead to an increase in the number of patients who have never experienced an ICD intervention. This indicates a need for more precise risk stratification and identification of both patients at particularly high risk and patients who are too healthy to benefit from ICD implantation [3–9].

Address for correspondence:
Aleksander Maciąg, MD, PhD, 2nd Coronary Artery Disease, Institute of Cardiology, ul. Spartańska 1, 02–637 Warszawa, Poland, e-mail: maciag_o@poczta.onet.pl
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Patient selection for the MADIT II and SCD-HeFT trials was based on a widely available determination of reduced left ventricular ejection fraction (LVEF). Reduced LVEF correlates well with all-cause mortality among patients with cardiac dysfunction, particularly resulting from previous myocardial infarction, but is less useful in the identification of patients at risk of malignant ventricular arrhythmia that would be amenable to ICD intervention [4]. Patients who qualify for ICD implantation based on these new expanded indications include those who at risk of mortality due to heart failure (HF) prior to the initial occurrence of ventricular tachycardia (VT) or ventricular fibrillation (VF), and also those patients who do not generate malignant ventricular arrhythmia despite reduced LVEF. More precise stratification was attempted in analyses of the MADIT II trial database that pointed at such risk factors of increased mortality as QRS complex duration, T wave alternans or the presence of ventricular late potentials [3, 5, 10, 11].

The aim of our study was to evaluate the effect of QRS complex duration and other simple clinical variables evaluated prior to ICD implantation on the occurrence of ventricular arrhythmia and mortality in this patient group.

METHODS

From an ICD implantation database run in our Department since 1995, we identified consecutive patients with CAD who underwent ICD implantation for primary prevention of SCD. Although first implantations were performed in 1995, we began to implant ICDs for primary prevention in CAD patients in 2000. The study period ended on August 31, 2007.

We analysed medical records related to ICD implantation and data collected during both scheduled routine follow-up visits and additional visits that took place due to arrhythmia occurrence or worsening of the patient clinical status. If data were lacking, we attempted to collect them actively by contacting the patients or their families. Follow-up continued for at least 1 year after ICD implantation or until patient death.

Study group

Using the above inclusion criteria, we selected and analysed a group of 121 patients. Duration of follow-up ranged from 42 to 2833 days, mean 876 ± 538 days, median 792 days. Assumed minimal duration of follow-up was 365 days, and 6 patients died before the end of the first year of follow-up. Clinical characteristics of the patients are shown in Table 1.

Table 1. Clinical characteristics of the patients (#3 patients with paced QRS complexes only were not included in the analysis)

Age [years]	62 ± 10
Female gender	15 (12%)
LVEF [%]	28 ± 4%
NYHA class I	1 (1%)
NYHA class II	68 (56%)
NYHA class III	52 (43%)
Previous MI	112 (94.1%)
Anterior wall	84 (69.4%)##
Inferior wall	44 (36.4%)##
Other	18 (14.9%)##
Cardiac arrest during acute MI	13 (11%)
Presence of nsVT	97 (77%)
Atrial fibrillation:	44 (36.4%)
Paroxysmal	28 (23.1%)
Permanent	16 (13.2%)
QRS width > 120 ms	56 (47%)#
Mean QRS width	124 ± 32 ms#
Indications for permanent cardiac pacing	24 (20%)
Patients with previously implanted pacemaker	6 (5%)
Diabetes	20 (16.5%)
Renal failure	19 (16%)
Previous coronary revascularisation (PTCA, CABG)	86 (71%)
PTCA	46 (38%)
CABG	30 (25%)
PTCA and CABG	10 (8%)

##43 patients had a history of more than one myocardial infarction event; LVEF — left ventricular ejection fraction; NYHA — New York Heart Association; MI — myocardial infarction; nsVT — non sustained ventricular tachycardia; PTCA — percutaneous transluminal coronary angioplasty; CABG — coronary artery bypass grafting

ECG analysis

We analysed archived ECG tracing to evaluate QRS complex duration. QRS width was measured manually in the available tracings (mostly at 25 mm/s), and the longest measured QRS duration in the tracing was used in for further analyses. ECG recordings showed only paced QRS complexes in 3 patients who were for that reason excluded from the analysis of this parameter. Among the remaining patients, QRS duration was ≥ 120 ms in 56 (47%) patients, including 37 patients with left bundle branch block. Mean QRS duration was 124 ± 32 ms.

Drug therapy

During follow-up, patients were treated in accordance with the current guidelines on the management of HF and CAD. Decisions regarding drug therapy and doses, including those of antiarrhythmic drugs, were taken by the treating physicians. Beta-blockers, including sotalol (4 patients), were used in 100% of patients. No uniform approach to antiarrhythmic drug therapy was used. Decisions to initiate or stop antiarrhythmic drug therapy, mostly with amiodarone, were also taken by clinicians working outside our centre. These changes in drug therapy were allowed also during follow-up, which might have affected the clinical course, and thus were not included in the statistical analysis. Before ICD implantation, amiodarone was known to be used in 34 patients, and it was withdrawn after ICD implantation in 15 patients. During long-term follow-up, none of the patients received class I antiarrhythmic drugs but they were used before ICD implantation in 3 patients.

Statistical analysis

Statistical analysis was performed using SAS 8.2 statistical package (SAS Institute Inc, Cary, NC, USA). Results of univariate analyses are shown as arithmetic means and SDs for quantitative variables, and as proportions and percentages for nominal variables. Normal distribution of quantitative variables was assessed using the Shapiro-Wilk test. To compare differences between means, the Student *t* test or the Cochran-Cox test was used depending on homogeneity or heterogeneity of variance. Homogeneity of variance was evaluated using the F test.

We performed univariate analyses on all variables that were considered potential predictors of mortality or ICD therapy, including both interrelationships between these variables and their independent effects on the analysed phenomena. As the next step, multivariate analyses were performed.

The effect of QRS complex duration (including only patients with non-paced QRS complexes) on the occurrence of arrhythmia and mortality was evaluated using the Kaplan-Meier survival estimates. Null hypotheses of no differences between the Kaplan-Meier curves for survival and arrhythmia-free survival were tested using the log-rank test.

Cox proportional hazards model was used to evaluate the effect of independent variables on survival and appropriate ICD interventions. The assumed hazard proportionality was verified by showing no effect of time-dependent explanatory variables on survival. Hazard ratios (HR) and 95% confidence intervals (CI) were calculated in uni- and multivariate analyses, with the use of backwards step-wise regression procedures in the latter ones. Null hypotheses were verified at the alpha level of ≤ 0.05.

RESULTS

ICD interventions

We identified all ICD interventions and divided them into appropriate and inappropriate ones occurring during individual 6-month follow-up periods, taking into account the number of patients at risk in each period.

Appropriate ICD therapy was noted in 44 (36%) patients, with multiple ICD interventions during follow-up in 32 patients. The first ICD intervention occurred at the mean of 533 days after device implantation (range 28 to 1447 days, median 381 days).

We analysed clinical factors that might have affected the occurrence of appropriate ICD interventions. Univariate Cox analyses showed that appropriate ICD interventions were more frequent in patients with QRS complex widening, younger patients, and patients with lower LVEF (Table 2).

The above mentioned risk factors of appropriate ICD interventions were then included in a multivariate analysis with the use of backwards step-wise regression procedure. This multivariate analysis showed that independent risk factors of appropriate ICD interventions included patient age at the time of device implantation (HR per each 10 year increment: 0.7, 95% CI 0.5–0.9, p = 0.0081) and widened native QRS complexes (HR per each 10 ms increment: 1.130, 95 CI 1.039––1.229, p = 0.0045).

We also analysed QRS complex duration at the time of ICD implantation. Analysis of Kaplan-Meier survival curves showed appreciably more frequent appropriate ICD interventions only in patients with QRS complex duration > 140 ms, with significant between-group differences, while no significant differences were observed when the cut-off value for between-group comparisons was set at the QRS complex duration of > 120 or 130 ms (Fig. 1).

Patients with arrhythmia long enough to receive ATP or shock treatment due to ventricular arrhythmia were included in the analysis. Using the ICD detection criteria the following was identified: VT up to 200/min, fast ventricular tachycardia (FVT) 200–250/min and VF above 200/min on the basis of morphology of intracardiac electrocardiogram.

Ventricular tachycardia as the only arrhythmia occurred in 16 patients (13% of the overall study population, 36% of patients with appropriate ICD interventions). In the remaining patients, faster arrhythmias were noted in addition to VTs of < 200 bpm, including FVT and VF. Single VT event was noted in 7 patients, and 9 patients experienced recurrent VT episodes (from 2 to 150 VT events).

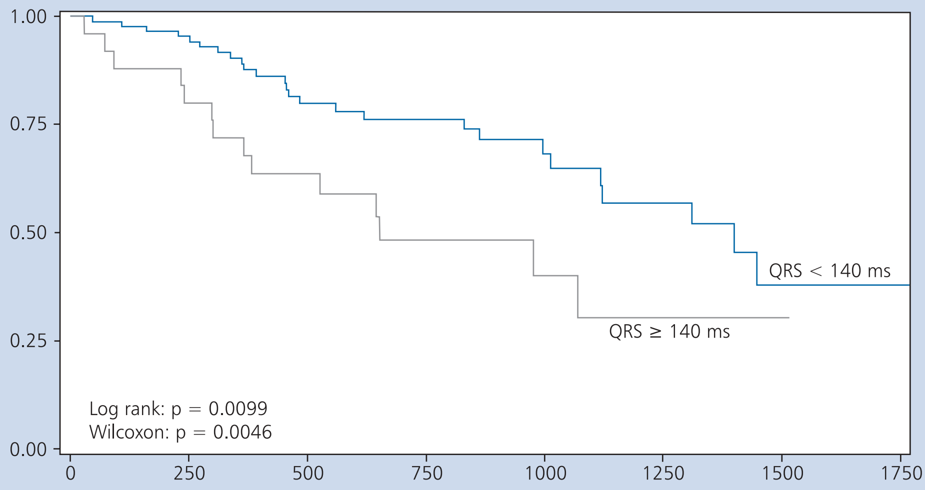
When we compared 16 patients solely with VT of < 200 bpm with the remaining patients with appropriate ICD interventions (at least one VF/FVT event), the VT group was shown to be characterised by wider QRS complexes (151 ± 48 *vs* 124 ± 31 ms, p = 0.0287) and higher prevalence of renal failure (6 [38%] *vs* 2 [7%] patients, p = 0.0190). The remaining clinical parameters at the time of ICD implantation were not useful at predicting the type of ventricular arrhythmia likely to occur in a given patient.

In the study population, overall 13 episodes of electrical storm were noted in 9 (7%) patients. During entire follow-up, more than one episode of electrical storm occurred in 3 patients. The occurrence of electrical storm was associated with an increased risk of mortality (HR 3.0; 95% CI 1.1–8.0, p = 0.0253). Overall, 6 (67%) out of 9 patients with at least 1 episode of electrical storm died during follow-up.

Table 2. Risk factors of appropriate implantable cardioverter-defibrillators (ICD) interventions (#3 patients with paced QRS complexes only were not included in the analysis)

Variable	HR (CI)	P
Age at the time of ICD implantation (per 1 year increment)	0.961 (0.936–0.986)	0.0026
Gender	0.7 (0.3–1.7)	NS
LVEF (per 1% increment)	0.962 (0.925–1.00)	0.05
NYHA class	1.7 (0.9–3.1)	NS
Previous MI:	0.8 (0.2–2.6)	NS
Number of infarctions	1.1 (0.8–1.5)	NS
Previous anterior infarction	1.9 (0.9–4.1)	NS
Previous inferior infarction	0.7 (0.4–1.4)	NS
Other previous infarction	0.5 (0.1–1.5)	NS
Cardiac arrest during acute MI	1.0 (0.4–2.8)	NS
Presence of nsVT before ICD implantation	1.0 (0.5–2.1)	NS
Atrial fibrillation:	1.7 (0.9–3.1)	NS
Paroxysmal	1.9 (1.0–3.6)	NS
Permanent	1.0 (0.4–2.5)	NS
QRS complex width (per each 10 ms increment)#	1.10 (1.01–1.20)	0.0219
Indications for permanent cardiac pacing	1.5 (0.7–3.2)	NS
Type of ICD:		
VVI-ICD	1.6 (0.8–3.2)	NS
DDD-ICD	0.7 (0.5–1.1)	NS
CRT-D	1.0 (0.7–1.4)	NS
Diabetes	0.9 (0.4–2.2)	NS
Renal failure	0.8 (0.4–1.9)	NS
Previous PTCA or CABG	0.6 (0.3–1.2)	NS

HR — hazard ratio; CI — confidence interval; rest abbreviations as in Table 1



Effective sample size

Time from implantation [years]	0–0.5	0.5–1.0	1.0–1.5	1.5–2.0	2.0–2.5	2.5–3.0	3.0–3.5	3.5–4.0	4.0–4.5
QRS < 140 ms	88.0	77.0	57.5	43.0	33.5	22.5	16.0	11.0	3.0
QRS ≥ 140 ms	28.0	24.0	17.5	11.5	6.5	5.5	2.5	1.5	0.5

Figure 1. Appropriate implantable cardioverter-defibrillators (ICD) interventions in relation to QRS complex width (cut-off value for the depicted curve: 140 ms)

Table 3. Risk factors for all-cause mortality (#3 patients with paced QRS complexes only were not included in the analysis)

Variable	HR (CI)	P
Age at the time of ICD implantation (per 1 year increment)	1.052 (1.001–1.104)	0.0437
LVEF (per 1% increment)	0.97 (0.92–1.02)	NS
NYHA class	4.7 (1.9–11.7)	0.0008
Occurrence of appropriate ICD intervention	0.74 (0.31–1.80)	NS
Occurrence of electrical storm	3.0 (1.1–8.0)	0.0253
Occurrence of inappropriate ICD intervention	0.80 (0.23–2.73)	NS
Previous MI:	1.3 (0.2–9.9)	NS
Previous anterior infarction	1.4 (0.5–3.8)	NS
Previous inferior infarction	1.1 (0.5–2.7)	NS
Other previous infarction	0.8 (0.2–3.6)	NS
Cardiac arrest during acute MI	0.4 (0.1–3.0)	NS
Presence of nsVT before ICD implantation	1.4 (0.4–4.7)	NS
Atrial fibrillation:	0.8 (0.3–2.0)	NS
Paroxysmal	0.92 (0.35–2.44)	NS
Permanent	0.77 (0.18–3.32)	NS
QRS complex width (per each 10 ms increment)#	1.123 (1.011–1.248)	0.0306
Indications for permanent cardiac pacing	3.5 (1.4–8.7)	0.0064
Type of ICD:		
VVI-ICD	0.7 (0.3–1.7)	NS
DDD-ICD	1.2 (0.7–1.8)	NS
CRT-D	1.1 (0.6–1.7)	NS
Diabetes	2.1 (0.7–5.7)	NS
Renal failure	2.4 (1.0–6.1)	0.058
Previous PTCA or CABG	0.31 (0.13–0.75)	0.009

HR — hazard ratio; CI — confidence interval; rest abbreviations as in Table 1

When we analysed clinical factors that might predict the occurrence of electrical storm, we found that only widened QRS complexes (HR 1.059, 95% CI 1.014–1.045, p = = 0.0002) and more advanced New York Heart Association (NYHA) class (HR 4.1, 95% CI 1.2–14.2, p = 0.0279) could have been associated with these events.

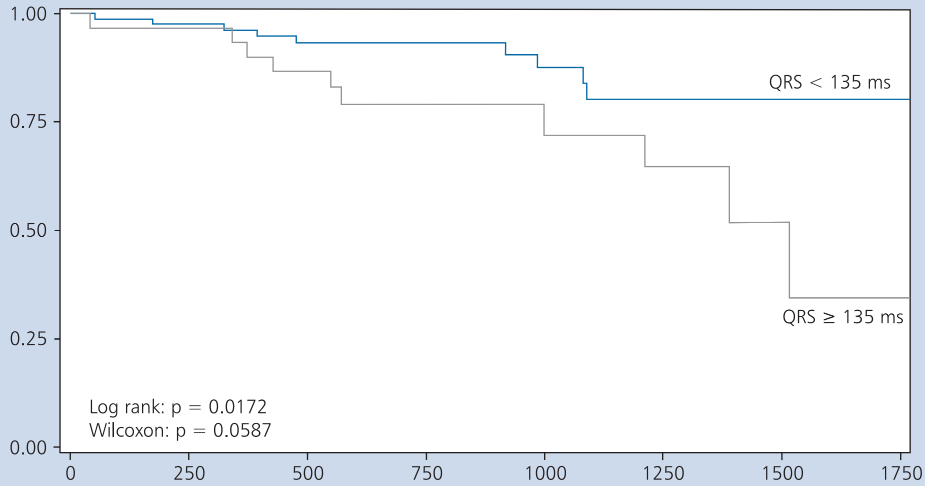
Mortality

Overall 21 (17%) patients died during follow-up. Based on the available medical records and interviews with patient family members, most cases (14 patients, or 12%) could be attributed to cardiovascular disease. Progression of chronic HF was the cause of death in 9 patients, complications of acute coronary syndromes in 2 patients, a complication of coronary artery bypass grafting in 1 patient, and SCD in 2 patients (preceded by multiple ICD interventions in 1 of these patients). Cancer was the cause of death in 4 (3.3%) patients, and in 3 (2.5%) patients the cause of death was unknown.

We analysed clinical factors that might have affected mortality. Univariate Cox analysis was performed to identify significant differences (Table 3). Patients with widened QRS complexes, older at the time of ICD implantation, with more severe HF symptoms, and with indications for permanent cardiac pacing were at higher risk of all-cause mortality. The occurrence of electric storm during follow-up was also associated with an increased risk of death. In contract, patient who underwent revascularisation were at lower risk of death.

We also performed multivariate analysis with the use of backwards step-wise regression procedure that included the above mentioned risk factors of all-cause and cardiovascular mortality. Independent risk factors of all-cause mortality included age at the time of ICD implantation (HR per each 10 year increment: 1.7, 95% CI 1.1–2.8, p = 0.0396), NYHA class (HR 4.4, 95% CI 1.7–11.5, p = 0.0022), and previous revascularisation (HR 0.3, 95% CI 0.1–0.7, p = 0.0060).

Similarly to the risk of appropriate ICD intervention, risk of all-cause mortality increased with QRS complex widening at the time of ICD implantation and become significant with QRS complex duration > 135 ms. Even wider QRS complexes were not associated with significantly increased risk, likely reflecting smaller numbers of patients in these groups (Fig. 2).



Effective sample size

Time from implantation [years]	0–0.5	0.5–1.0	1.0–1.5	1.5–2.0	2.0–2.5	2.5–3.0	3.0–3.5	3.5–4.0	4.0–4.5
QRS < 135 ms	86.5	78.0	65.0	52.5	41.0	30.0	21.0	17.0	11.0
QRS ≥ 135 ms	31.0	29.5	27.0	21.5	15.5	12.5	9.5	6.0	2.5

Figure 2. Survival curve (for cut-off QRS complex width of 135 ms) showing all-cause mortality in relation to QRS complex width at the time of implantable cardioverter-defibrillators (ICD) implantation

DISCUSSION

Use of ICD results in a significant mortality reduction among patients at risk of SCD. As suggested by authors of the DEFINITE study, mortality reduction by ICD therapy may be estimated as half of all appropriate interventions [12]. Despite these limitations, evaluation of the occurrence of appropriate ICD interventions seems to be the best indicator of the effectiveness of ICD therapy, and identifying factors associated with these interventions is of paramount importance in the assessment of benefits from this therapy [13]. In our study, appropriate ICD interventions were noted during long-term follow-up in 44 (36%) patients. This proportion is higher compared to MADIT II (23.5%) and SCD-HeFT (21%) trial populations [1, 2].

Of note, QRS complex widening noted before ICD implantation was associated with both the occurrence of sustained ventricular arrhythmia and thus ICD interventions, and with all-cause mortality. It seems that worse prognosis associated with QRS complex widening results from HF progression in these patients. This is of particular importance as we now have effective therapeutic modalities for patients with intraventricular conduction disturbances. In the recent years, we have seen dynamic growth of cardiac resynchronisation therapy that may ameliorate intraventricular conduction disturbances [14–17]. A significant effect of QRS complex widening on the benefits from ICD and CRT-D therapy was also seen in MADIT II, COMPANION, and MADIT-CRT studies [3, 14, 18, 19].

In our study, we evaluated clinical factors present before ICD implantation that were associated with the occurrence of rapid (> 200 bpm), potentially haemodynamically unstable ventricular arrhythmia. ICD interventions to treat such arrhythmias are of major importance. In patients who present only with slower stable monomorphic VT, ICD implantation could be deferred or withheld, with reduction of potential adverse effects of such therapy [7, 8]. Among the analysed clinical variables, however, only QRS complex widening and renal failure were shown to be more frequent among patients with slower arrhythmia. In addition, QRS complex widening indicated a higher risk of ventricular arrhythmia and increased mortality. Thus, it is difficult to identify clinical factors present before ICD implantation in these patients that would allow predicting which type of ventricular arrhythmia will lead to ICD intervention in a given patient.

Regarding LVEF, our analysis showed that lower values of this parameter were associated with a higher probability of an appropriate ICD intervention. This risk seems to be increased when LVEF is less than 20%. Worsening of HF symptoms, related to more advanced NYHA class, resulted in an increased likelihood of electrical storm and death but did not affect the probability of an appropriate ICD intervention. Somewhat different results were obtained for these parameters in an analysis of the MADIT II study population. Zareba et al. showed that NYHA class II–III and renal dysfunction were associated with significantly more frequent ICD interventions and increased mortality. In contrast, these authors did not found a similar relationship for LVEF [6, 9, 20–23].

In our study group, we documented the effect of age on the arrhythmia occurrence, with less frequent arrhythmias in older patients. Similarly to the MADIT II trial population, this effect seems to be related to an increased incidence of other disease and increased mortality due to other causes before any appropriate ICD intervention [6].

A particular example of appropriate ICD intervention is the occurrence of an electrical storm. In the MADIT II trial population, which was similar to our study population, electrical storm was noted in 4% of patients (27 of 719), compared to 23–40% among secondary prevention patients, mainly in patients with ICD implanted due to symptomatic VT [8, 24–27]. In our study population, an electrical storm occurred in 9 (7%) patients. Risk factors included widened QRS complexes and higher NYHA class, while previous revascularisation could have a protective effect. Both NYHA class and widened QRS complexes indicate 2 frequent mechanisms leading to an electrical storm. The first of them (which is associated with the worst prognosis) is related to end-stage HF, while the second (i.e., widened QRS complex) is related to slowed cardiac conduction, which predisposes to VT occurrence. Of note, occurrence of electrical storm is associated with increased mortality. Such a relationship has not observed for single episodes of ventricular tachyarrhythmia leading to ICD intervention.

Patient mortality has been a significant limitation of ICD therapy, related mostly to HF, progression of underlying cardiac disease, and cancer. Similarly to appropriate ICD interventions, risk has been increased with QRS complex widening. In addition, our analysis showed an increased mortality risk associated with lower LVEF values. Worsening of HF symptoms associated with higher NYHA class also had a significant effect on mortality.

An increased mortality risk was observed in patients who required permanent cardiac pacing. This could have been related to more severe myocardial damage leading to conduction disturbances or abnormal automaticity, as well as an adverse effect of right ventricular pacing on cardiac performance [28, 29].

In our study group, mortality was reduced with previous revascularisation, either surgical or percutaneous, although we did not observe any beneficial effect of revascularisation on the number of appropriate ICD interventions. A positive effect of revascularisation was show in the CABG-Patch study, in which no benefit from prophylactic ICD implantation may be explained by a relatively low number of SCD after successful revascularisation. Among patients with a transvenous ICD system, an analysis of the MADIT II study performed by Woldenberg et al. showed that revascularisation reduced both all-cause mortality and the incidence of SCD [30, 31].

Limitations of the study

A significant limitation of our study is the retrospective nature of patient data analysis, resulting in some missing information, for example on the cause of death of 3 patients, and also regarding significant aspects of treatment, including antiarrhythmic drug therapy. We also did not obtain data stored in the ICD memory during the period immediately preceding death.

In addition, our findings might have been affected by a relatively small size of the study population, and also inclusion of patients with indications for cardiac resynchronisation therapy in whom this therapy was not used due to its limited availability.

CONCLUSIONS

Appropriate ICD interventions are more common in patients with widened QRS complexes and younger patients. In our study population, increased mortality was related to higher NYHA class and older age, while previous revascularisation was associated with a significant mortality reduction. A significant association with widened QRS complexes was noted only in univariate analysis.

A significant association of widened QRS complexes with the occurrence of ventricular arrhythmia, electrical storm, and patient mortality (in univariate analyses), as well as frequent coexistence of HF suggest the need for wider consideration of the therapy that may modify this risk factor, i.e. cardiac resynchronisation therapy.

Conflict of interest: *Aleksander Maciąg, MD, PhD: proctoring contract for Medtronic Poland, Principal Investigator in Medtronic's sponsored trial, scientific grants from Vitatron, Medtronic Sorin and Biotronik, travelling grants from Medtronic, SJM and Biotronik, lecturer's fees from Medtronic, Biotronik, SJM; Andrzej Przybylski, MD, PhD: consultant for Biotronik, Principal Investigator in Medtronic's sponsored trial, scientific grant from Biotronik, travelling grants from Medtronic, Biotronik, and SJM, lecturer's fees from Medtronic and SJM; Maciej Sterliński, MD, PhD: proctoring contract for Medtronic, consultant for Biotronik, scientific grants from Medtronic, Sorin and Vitatron, travelling grants from Medtronic, Biotronik, SJM and Sorin and lecturer's fees from Medtronic, SJM and Sorin; Michał Lewandowski, MD, PhD: travelling grants from Medtronic, Biotronik, SJM and Sorin and lecturer's fees from SJM; Katarzyna Gepner, MD: no conflict; Ilona Kowalik, MSc: no conflict; Paweł Derejko, MD, PhD: no conflict; Mariusz Pytkowski, MD, PhD: no conflict; Łukasz Szumowski, MD, PhD: lecturer's and travelling grants from Biotronik, Medtronic, Jonhson&Jonhson, advisory board Sanofi-Aventis, consultant for Biotronik; Hanna Szwed, MD, PhD, professor of medicine: scientific grants from Medtronic, Vitatron and Sorin, travelling grants from Medtronic, Biotronik and Sorin, lecturer's fees from Medtronic.*

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Poszerzenie zespołów QRS jako czynnik adekwatnych interwencji kardiowertera-defibrylatora (ICD) i zwiększonej śmiertelności u pacjentów z profilaktycznie implantowanym ICD

Aleksander Maciąg[1], Andrzej Przybylski[2], Maciej Sterliński[1], Michał Lewandowski[1], Katarzyna Gepner[1], Ilona Kowalik[1], Paweł Derejko[2], Mariusz Pytkowski[1], Łukasz Szumowski[2], Hanna Szwed[1]

[1]II Klinika Choroby Wieńcowej, Instytut Kardiologii, Warszawa

[2]Klinika Zaburzeń Rytmu Serca, Instytut Kardiologii, Warszawa

Streszczenie

Wstęp: Duże randomizowane badania potwierdziły skuteczność automatycznego kardiowertera-defibrylatora (ICD) w profilaktyce pierwotnej nagłego zgonu sercowego (SCD).

Cel: Celem pracy była analiza wpływu prostych czynników klinicznych obecnych przed implantacją na częstość adekwatnych wyładowań i śmiertelność w grupie badanej.

Metody: Analizowano dane 121 kolejnych pacjentów z chorobą wieńcową z ICD implantowanym w ramach profilaktyki pierwotnej SCD w latach 2001–2007. W grupie badanej było 15 kobiet i 106 (88%) mężczyzn w średnim wieku 62 ± 10 lat. Średni czas obserwacji wynosił 876 ± 538 dni.

Wyniki: Adekwatnych interwencji ICD doświadczyło 44 (36,4%) pacjentów. Poszerzony zespół QRS (na każde 10 ms; HR 1,13; 1,039–1,229; p = 0,0045), młodszy wiek w chwili implantacji (na każde 10 lat; HR 0,7; 0,5–0,9; p = 0,0081) wiązały się z większym ryzykiem adekwatnych interwencji. Poszerzenie zespołów QRS było również związane z częstszym występowaniem burzy elektrycznej (HR 1,059; 1,014–1,045; p = 0,0002). W grupie badanej zmarło 21 (17,4%) pacjentów. Poszerzony zespół QRS (na każde 10 ms; HR 1,123; 1,011–1,248; p = 0,0306 — tylko w analizie jednoczynnikowej), starszy wiek w chwili implantacji (na każde 10 lat; HR 1,7; 1,1–2,8; p = 0,0396), wyższa klasa NYHA (HR 4,4; 1,7–11,5; p = 0,0022) wiązały się ze zwiększoną śmiertelnością. Wykonanie rewaskularyzacji wieńcowej zmniejszało śmiertelność (HR 0,3; 0,1–0,7, p = 0,006).

Wnioski: Niezależnie od innych czynników ryzyka poszerzony zespół QRS w trakcie implantacji może się wiązać z częstszym występowaniem adekwatnych interwencji ICD i podwyższonym ryzykiem zgonu. Zwiększa także ryzyko wystąpienia burzy elektrycznej.

Słowa kluczowe: poszerzony zespół QRS, adekwatne interwencje ICD, ryzyko zgonu

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Adres do korespondencji:
dr n. med. Aleksander Maciąg, II Klinika Choroby Wieńcowej, Instytut Kardiologii, ul. Spartańska 1, 02–637 Warszawa, e-mail: maciag_o@poczta.onet.pl

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