

Elderly and patients with sick sinus syndrome have lower chances for appropriate pacemaker mode selection, according to the Polish Cardiac Society recommendations – a single-centre retrospective analysis

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Abstract

Background: The Polish Cardiac Society recommendations for permanent heart pacing have been valid since 1999. The clinical use of these guidelines is, however, still limited.

Aim: To analyse whether the chosen pacing strategy is consistent with the Polish Cardiac Society recommendations and to estimate the effects of analysed factors on selecting optimal or suboptimal pacing modes.

Method: Retrospective analysis of medical records and procedure protocols of 1052 patients who underwent pacemaker implantation between 1 January 2000 and 31 December 2004 was performed. In each case, the applied pacing mode was compared against the optimal one defined according to the guidelines of the Polish Cardiac Society. A number of demographic and clinical factors associated with the procedure were analysed and correlated with the optimal pacing mode selection.

Results: During the analysed period, 59.3% of patients received optimal pacing. The percentage of patients with optimal pacing increased in the consecutive years from 40.2% in 2000 to 68.5% in 2005. In a univariate regression analysis, patients above the age of 70 years, with sick sinus syndrome as an indication for pacing, as well as cardiac heart failure and obesity, received optimal pacing significantly less frequently. In a multivariate analysis, advanced age and sick sinus syndrome were found to be independent predictors of suboptimal pacing.

Conclusions: About 60% of patients had their pacemakers implanted with the optimal pacing mode selection according to the valid recommendations. Patients over the age of 70 years, as well as patients with sick sinus syndrome, had significantly lower chances of receiving optimal pacing.

Key words: cardiac pacing, optimal pacing mode, guidelines

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Introduction

For many years now, pacemaker implantations have been routine procedures performed by invasive cardiologists and cardiac surgeons. Sinus node dysfunction and atrioventricular conduction disorders are still the most common indications for pacemaker implantation [1]. Nevertheless, patients requiring pacemaker implantation are a heterogeneous population. Also, there is a range of available pacing modes, from the

oldest single chamber, through dual chamber to biventricular pacing [2]. It was mandatory to work out standards of patient selection for pacemaker implantation, as well as rules governing the most appropriate pacing mode selection. They are to be found in guidelines updated every few years by international and national cardiac societies. The most widely accepted are the guidelines issued by joint American societies, with the most recent update in 2002 [3]. Also, in 1999 the

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Pacemaker and Electrophysiology Section of the Polish Cardiac Society worked out its *Guidelines for Heart Electrotherapy* [4]. Unfortunately, there are only scarce reports in national and foreign medical literature assessing how physicians comply with these guidelines.

The aim of this study was to analyse whether the chosen pacing mode is consistent with relevant recommendations and to estimate the influence of certain factors on the selection of optimal or suboptimal pacing mode.

Methods

The analysed group consisted of all patients undergoing their first pacemaker implantation in our centre between 1 January 2000 and 31 December 2004. In each case, the patient's medical records and procedure protocol were analysed. Based on medical records and the guidelines of the Polish Cardiac Society published in 1999 [4], the optimal pacing mode was defined and compared with the pacing mode chosen by the operator. The following data used for the analysis of correlation with the chances for optimal pacing were recorded: gender, age at the time of the procedure, the course of the procedure (urgent/planned), operator, diagnosed heart failure, ischaemic heart disease, arterial hypertension, or diabetes mellitus, and obesity defined as BMI >35.

Statistical analysis

Logistic regression analysis, using SPSS 13.0 software (SPSS Inc., USA), was used to verify correlations. Variables which appeared to be associated with chances for selection of the optimal pacing mode in the univariate analysis were analysed by multivariate analysis. A *p* value <0.05 was accepted as statistically significant.

Results

In the studied period, cardiac pacemakers were implanted in 1052 patients aged 68±7 years, of whom 475

(45.2%) were males. The main indications for permanent pacing were: sick sinus syndrome in 437 (41.5%) patients, AV conduction disorders in 313 (29.8%) patients, chronic atrial fibrillation (AF) with bradyarrhythmia in 290 (27.6%) patients and cardiodepressive type of vasovagal syndrome in 12 (1.1%) patients. In 718 patients VVI (R), in 269 patients DDD (R), in 52 patients VDD (R) and in 13 patients AAI (R) pacemakers were used. A comparison of pacing modes used in patients with particular indications is presented in Table I.

The pacing mode used in the studied patients agreed with the optimal mode identified based on the Polish Cardiac Society guidelines in 624 (59.3%) patients.

The percentage of patients with the optimal pacing mode increased in the consecutive years from 40.2% in 2000 to 68.5% in 2005. In 27 (2.6%) patients a pacing mode other than the optimal one was applied because of technical difficulties during the procedure, as recorded in the protocol. They included problems with the venous approach, fixation of the pacing lead, and unstable pacing thresholds. The majority of patients not receiving optimal pacing were those with sick sinus syndrome and with AV block – 284 and 144 patients respectively, in whom VVI (R) mode pacemakers were finally implanted.

According to the univariate regression analysis, patients aged over 70 years, with sick sinus syndrome as an indication for pacing, cardiac heart failure and obesity received optimal pacing significantly less frequently (Table II). Multivariate logistic regression analysis revealed age and indication for pacing to be independent predictors of inappropriate pacing (Table III).

Discussion

In the present study we have found that in a group of over one thousand patients treated in our centre between 2000 and 2004, about 60% received appropriate pacing (according to the Polish Cardiac Society recommendations). This percentage seems to be low; however, in a similar analysis performed by a Canadian research team [5] it was 50%. Only in 3% of cases did the choice of a pacing mode other than the optimal result from technical reasons outlined in the study protocol. It might be so that difficulties were not in all cases adequately reported in the procedural records. The increasing rate of optimal stimulation in the consecutive years of the analysed period is undoubtedly a positive aspect of the presented results.

The main groups not receiving optimal pacing included: patients with AV block (VVI (R) pacing instead of DDD (R)/VDD (R)) and patients with sick sinus syndrome (VVI (R) instead of AAI (R)/DDD (R)). Suboptimal stimulation in the first group can be explained by the

Table I. Distribution of pacing modes in patients with specific indications for permanent pacing

	DDD (R)	VDD (R)	VVI (R)	AAI (R)	Total
SSS	140	0	284	13	437
AV block	117	52	144	0	313
AF with bradyarrhythmia	0	0	290	0	290
Vasovagal Syndrome	12	0	0	0	12
Total	269	52	718	13	1052

Abbreviations: SSS – sick sinus syndrome, AV – atrioventricular, AF – atrial fibrillation

Table II. Univariate analysis: variables characterising the patients and the odds for optimal pacing

	Number of patients	Number of patients with optimum pacing mode	Odds ratio	p
Age >70 years	402	172	0.74	0.004
Male gender	475	286	1.12	0.131
Indication:				
SSS	437	153	0.54	<0.001
AV block	313	169	1.17	0.158
AF with bradyarrhythmia	290	290	–	–
Vasovagal Syndrome	12	12	–	–
Urgent procedure	235	133	0.96	0.279
Comorbidities:				
Heart failure	353	188	0.78	0.021
Ischaemic heart disease	285	168	0.90	0.281
Arterial hypertension	457	270	0.95	0.483
Diabetes	54	35	1.12	0.352
Obesity	97	47	0.63	0.023
Total	1052	624		

Abbreviations: as in Table I

greater availability of single chamber pacemakers. However, in a large group of patients, i.e. subjects with sick sinus syndrome, physiological stimulation can be achieved with a single chamber pacemaker operating with an atrium placed lead (AAI (R) mode). There is, however, a risk of the need of upgrading in the case of AV block development; it is estimated to be 0.3–5% per year [6, 7]. Nevertheless, it seems that, despite difficulties, atrial pacing still paves the way for wider use.

Many clinical studies have compared the outcome of ventricular vs physiological pacing, i.e. atrial or double chamber pacing [8-11]. These studies were conducted in patients with sick sinus syndrome [8-11], and AV block [9, 10]. The majority of them revealed benefits from physiologic pacing translating into an improvement in quality of life, a reduction in incidence of AF, stroke and heart failure rate, and in some cases even a reduction in mortality [8]. A recently published meta-analysis of 31 randomised clinical trials showed a significantly lower incidence of AF and pacemaker syndrome in patients with physiological pacing, as well as a statistical trend towards the reduction of mortality, rate of stroke and heart failure [12].

Our study population was characterised according to several clinical and demographic parameters. It does not differ from populations in large clinical trials involving patients after pacemaker implantation [9-11]. Attention should be paid to the high burden of comorbidities – only 153 (14.5%) patients were free from all five coexisting disorders.

Demographic (age, gender) as well as clinical factors (indication for the procedure, coexisting diseases) and factors related to the procedure itself (course of the procedure, operator) were subjected to correlation analysis. In the univariate logistic regression analysis, four of them appeared to be statistically significant: elderly patients, as well as patients with sick sinus syndrome, heart failure or obesity, had a lower chance of achieving optimal pacing. In the multivariate analysis only the first two factors were found significant, i.e. age and sick sinus syndrome. One might speculate that such a discrepancy results from an association between the age and the rate of heart failure and obesity.

According to the results of some previous studies, double chamber pacemakers were less frequently implanted in women than in men [13, 14]. An extensive analysis of the Dutch registry including approximately 40 thousand procedures performed in the 1990s did not

Table III. Multivariate analysis: variables characterising the patients and the odds for optimum pacing

	Odds ratio	p
Age >70 years	0.79	0.036
SSS	0.62	0.010
Heart failure	0.85	0.125
Obesity	0.76	0.106

Abbreviations: as in Table I

confirm such a difference [15]. Also in the present study gender did not correlate with the chance of receiving optimal pacing.

In comparison with the general population, elderly patients with sick sinus syndrome probably benefit even more from physiological pacing [16]. Also, in this group of patients the major complication of ventricular pacing is observed – the pacemaker syndrome [17]. Thus it is difficult to find an excuse for other than optimal pacing in elderly patients with sick sinus syndrome.

Conclusions

1. In a single-centre retrospective study, about 60% of patients who underwent pacemaker implantation between 2000 and 2004 received the optimal pacing, as defined in the Polish Cardiac Society recommendations.
2. During the studied period, in the consecutive years, the percentage of appropriate pacing increased steadily from 40.2% to 68.5%.
3. Patients aged over 70 years, as well as those with sick sinus syndrome, had a significantly lower chance of receiving optimal pacing mode.
4. A similar situation, if present also in other centres, calls for radical changes, i.e. the application of optimal physiologic pacing in such patients.

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Osoby starsze oraz pacjenci z zespołem chorej zatoki mają mniejsze szanse na tryb stymulacji zgodny ze standardami Polskiego Towarzystwa Kardiologicznego – jednośrodkowa analiza retrospektywna

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Streszczenie

Wstęp: Od 1999 r. obowiązują standardy Polskiego Towarzystwa Kardiologicznego dotyczące stałej stymulacji serca. Niewiele wiadomo na temat zastosowania tych wytycznych w praktyce.

Cel: Ocena zgodności trybu stymulacji wybieranego podczas zabiegu implantacji rozrusznika ze standardami Polskiego Towarzystwa Kardiologicznego. Określenie wpływu niektórych czynników na wybór optymalnego lub nieoptymalnego trybu stymulacji.

Metodyka: Retrospektywnie przeanalizowano historie chorób i protokoły operacyjne wszystkich 1052 chorych poddanych zabiegowi wszczęcia rozrusznika serca w latach 2000–2004. W każdym przypadku porównano implantowany tryb stymulacji z trybem zalecanym w standardach Polskiego Towarzystwa Kardiologicznego. Szereg czynników demograficznych, klinicznych i związanych z zabiegiem poddano analizie pod kątem korelacji z wyborem optymalnego trybu stymulacji.

Wyniki: W analizowanym okresie 59,3% chorych otrzymało rozrusznik o optymalnym trybie stymulacji. Odsetek ten rósł w kolejnych latach: od 40,2% w 2000 r. do 68,5% w 2004 r. W dwuczynnikowej analizie regresji logistycznej mniejszą szansę na optymalny tryb mieli chorzy powyżej 70. r.ż., pacjenci z zespołem chorego węzła zatokowego, z niewydolnością krążenia lub z otyłością. W analizie wieloczynnikowej niezależnymi czynnikami powiązаныmi z punktem końcowym były: wiek oraz zespół chorego węzła zatokowego.

Wnioski: Niespełna 60% chorych ma implantowany rozrusznik o trybie stymulacji zgodnym ze standardami. Mniejszą szansę na to mają chorzy starsi oraz pacjenci z zespołem chorego węzła zatokowego.

Słowa kluczowe: stała stymulacja serca, standardy postępowania

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