Europace (2015) **17**, 148–151
doi:10.1093/europace/euu395

Do cardiologists follow the European guidelines for cardiac pacing and resynchronization therapy? Results of the European Heart Rhythm Association survey

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Received 25 November 2014; accepted after revision 15 December 2014

The purpose of this European Heart Rhythm Association (EHRA) EP wire survey was to evaluate the implementation of the current guidelines for cardiac pacing and cardiac resynchronization therapy (CRT) in Europe. A total of 48 centres replied to the survey, 34 of them (71%) were university hospitals. All responding centres implement CRT in patients with classical indications, i.e. sinus rhythm, New York Heart Association (NYHA) functional class II, III, or ambulatory IV, left ventricular ejection fraction (LVEF) 35%, and left bundle-branch block (LBBB) with QRS duration >150 ms, while 31 centres (67%) would implant a CRT device in patients with the same characteristics but with a non-LBBB pattern. Forty-one centres (89%) would also implant CRT in patients with sinus rhythm, NYHA Class II, III, or ambulatory IV, LVEF <35%, and LBBB with QRS duration between 120 and 150 ms, while only eight centres (17%) would implant the device in patients with the same characteristics but with a non-LBBB pattern. In patients with LVEF <35% and QRS duration below 120 ms, the majority of the centres (80%) would implant a single- or dual-chamber implantable cardioverter-defibrillator, but in nine cases (20%) no device was considered to be indicated. The results of this survey showed a good adherence to some of the current recommendations. Still some reluctance exists when offering the device therapy to patients with QRS duration in the lower range.

Keywords Cardiac pacing • Cardiac resynchronization therapy • ESC guidelines • Adherence • EHRA survey • EP wire

Introduction

Cardiac resynchronization therapy (CRT) is a well-established treatment for patients with heart failure (HF) symptoms despite optimal medical therapy. The current guidelines from the European Society of Cardiology (ESC) for cardiac pacing and CRT have introduced some interesting changes in the indications for conventional pacing and CRT.[1,2]

The indications for pacing in patients with bundle-branch block and syncope are underlining the usefulness of invasive tests prior to device choice which has emerged from some recent data.[3] For patients with HF that can benefit from CRT more importance has been given to QRS morphology which, combined with duration, can identify those that are more likely to benefit from this therapy.

The purpose of this European Heart Rhythm Association (EHRA) electrophysiology (EP) Wire survey was to evaluate the implementation of the current guidelines and to compare the implant strategies and follow-up of CRT devices across Europe.

Methods and results

Participating centres

This survey is based on an electronic questionnaire sent to the EHRA (EP) research network centres. Of 48 responding centres 34 (71%) were university hospitals, 4 (8%) were private hospitals, and the remaining 10 (21%) were other types of hospitals. Among the responding centres, 45 out of 48 specified their geographical

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location. Fifteen countries were represented: 14 centres in the UK, 6 in Spain, 5 in Italy and Germany, 3 in Denmark, 2 in France and Romania, and 1 centre in Austria, Belgium, Estonia, Georgia, Greece, Lithuania, Netherlands, and Norway.

Most of the centres (52%) were high-volume (>400 devices) device implanting centres, while 35% were medium-volume implanting centres (200–399 devices). The distribution of conventional pacemakers, implantable cardioverter-defibrillators (ICDs), and CRT devices is shown in *Table 1*. The majority of the centres (56%) reported an annual CRT implantation rate between 1 and 99.

Cardiac pacing

Forty-five centres provided answers to the questions regarding the use of pacemakers in two specific clinical situations.

In the case of unexplained syncope in patients with bundle-branch block and left ventricular ejection fraction (LVEF) >35%, the majority of the centres (38%) would insert an implantable loop recorder (ILR) after a negative EP study while another 22% would complete patient evaluation by performing an EP study with programmed stimulation.

Table 1 Device implantations per year in the responding centres (*N* = 48)

	None	1–99	100–199	200–399	400 or more
Pacemakers	0	8	10	18	12
ICDs	1	18	13	13	3
CRT	1	27	13	6	1

ICD, implantable cardioverter-defibrillator; CRT, cardiac resynchronization therapy.

In 12 of the responding centres (27%), ILR would be implanted without any further investigation, while in 6 centres (13%) a dual-chamber DDD pacemaker would be implanted without any further investigations.

In patients with undocumented reflex syncope, 29 (64%) centres would implant a pacemaker in the case of cardio-inhibitory carotid sinus syncope or in the case of a cardio-inhibitory tilt-induced response. The remaining 16 (36%) centres would never consider implanting a pacemaker in this clinical scenario.

Cardiac resynchronization therapy

Forty-six centres provided answers to the questions regarding CRT indications, implanting techniques, and follow-up. The results regarding the use of CRT in patients with sinus rhythm in New York Heart Association (NYHA) Class II, III, or ambulatory IV and LVEF <35% are presented in *Table 2*.

All 46 of the responding centres (100%) declared that they would implant a CRT device in patients with sinus rhythm, in NYHA Class II, III, or ambulatory IV, LVEF <35% and left bundle-branch block (LBBB) with QRS duration >150 ms, while only 31 (67%) centres would use CRT in patients with the same characteristics but with a non-LBBB configuration.

Forty-one centres (89%) stated that they would implant a CRT device in patients with sinus rhythm, in NYHA Class II, III, or ambulatory IV, LVEF <35% and LBBB with QRS duration between 120 and 150 ms, while only 8 (17%) centres would use CRT in patients with the same characteristics but with a non-LBBB configuration.

In patients with permanent atrial fibrillation (AF) in NYHA Class II, III, or ambulatory IV, LVEF <35% and QRS >120 ms, the majority of the centres (74%) would implant a CRT device and schedule for atrioventricular (AV) junction ablation only in the presence of uncontrolled heart rate. A minority of centres (11%) would proceed with AV ablation regardless of heart rate control. In two (4%) centres,

Table 2 Use of CRT and ICD in the responding centres (*N* = 46)

	Device type chosen				
Clinical findings	**CRT-P**	**CRT-D**	**VVI-ICD**	**DDD-ICD**	**No device**
SR, LVEF <35% NHYA II–IV LBBB >150 ms (Class I)	4 (9%)	42 (91%)	0	0	0
SR, LVEF <35% NHYA II–IV LBBB 120–150 ms (Class I)	5 (11%)	36 (78%)	2 (4%)	3 (7%)	0
SR, LVEF <35% NHYA II–IV Non-LBBB >150 ms (Class IIa)	3 (6%)	28 (61%)	8 (18%)	7 (15%)	0
SR, LVEF <35% NHYA II–IV Non-LBBB 120–150 ms (Class IIb)	0	8 (17%)	22 (48%)	10 (22%)	6 (13%)
SR, LVEF <35% NHYA II–IV QRS <120 ms (Class III)	0	1 (2%)	29 (63%)	7 (15%)	9 (20%)

SR, sinus rhythm; NYHA, New York Heart Association class; LBBB, left bundle-branch block; CRT-P, cardiac resynchronization therapy pacemaker; CRT-D, cardiac resynchronization therapy defibrillator; VVI-ICD, single chamber implantable cardioverter-defibrillator; DDD-ICD, dual chamber implantable cardioverter-defibrillator.

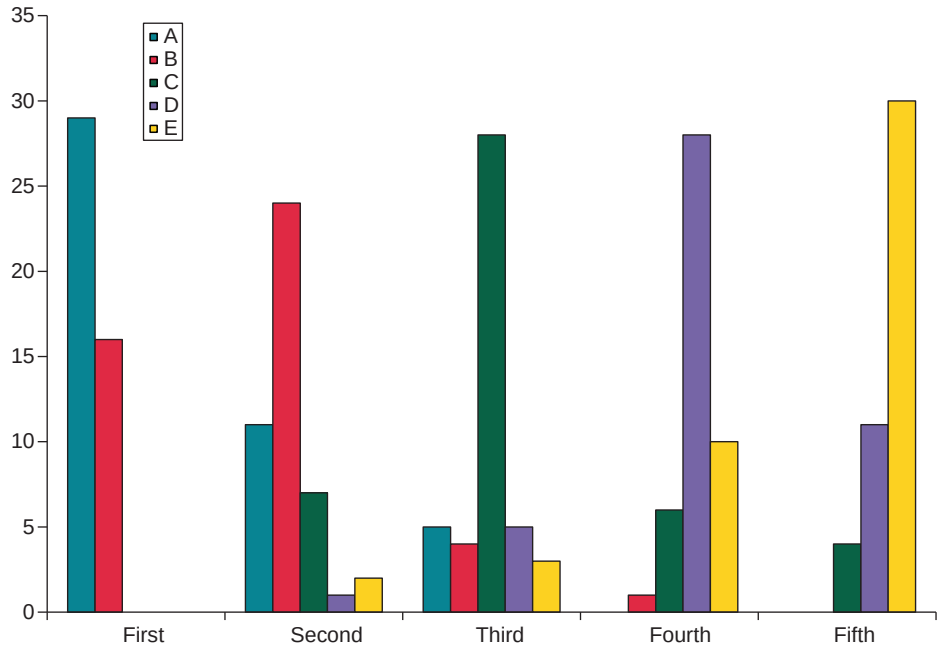

Figure 1 Actions taken to manage patients that do not respond to CRT. On the *X*-axis priority given to the listed actions, on the *Y*-axis number of centres. (*A*) Re-evaluation and possibly optimization of medical therapy; (*B*) Echo-guided optimization of atrio-ventricular and inter-ventricular delay; (*C*) Evaluation of biventricular capture during ergometric test; (*D*) Surgical correction of the left ventricular lead position; (*E*) Multisite left ventricular pacing.

CRT would be employed without further action being taken and in the remaining five (11%) a single-chamber ICD would be implanted.

Regarding the use of CRT in patients with high-degree AV block and reduced LVEF, 36 (78%) centres would implant CRT-pacemaker in patients with third-degree AV block or AV block II type 2 and reduced LVEF; 9 (10%) centres would implant a conventional DDD pacemaker and only 1 centre (2%) would implant CRT-defibrillator.

Prior to CRT implantation nearly all the centres (98%) would perform thorough clinical examination to assess NYHA class and two-dimensional echocardiography (91%). Further evaluation with magnetic resonance imaging studies would be performed in 14 (31%) centres, while speckle tracking echocardiography would be used in only 7 (16%) centres.

For the left ventricular (LV) lead positioning, the posterolateral region would be selected by 21 (46%) responding centres regardless of HF aetiology, while 2 (4%) centres would only use this position in patients with dilated cardiomyopathy. Twenty-one (46%) centres would choose a basal or mid-ventricular position of the anatomically most suitable venous branch of the coronary sinus, and 2 (4%) would place the LV lead at the latest activated segment according to echocardiographic examination.

In order to evaluate the response to CRT, most of the centres (73%) rely on symptomatic improvement alone or in combination to signs of reverse remodelling on echocardiography (58%). In 16 (36%) centres all of these parameters including a 6 min walking test are used.

In patients who do not respond to CRT, the first action taken in most cases (64%) is re-evaluation and possibly optimization of medical therapy. Less often (36%), the first step in the management of non-responders is echocardiography-guided optimization of AV and inter-ventricular (VV) delay, while this is more often considered the second step (53%) after the re-assessment of medical therapy (*Figure 1*). Most of the responding centres (71%) follow their CRT patients with a combination of remote monitoring and office visits, while in the rest of the cases the patients are followed exclusively in the clinic by a doctor in 22% of the cases and by a specialized nurse in 7% of the cases.

Discussion

The results of this EP Wire survey have shown, in general, an encouraging high level of adherence to the current ESC guidelines for cardiac pacing and CRT among the responding centres.

Regarding the management of patients with bundle-branch block and unexplained syncope, the finding that most centres would evaluate these patients with an EP study before proceeding with the device choice is in accordance with the current guidelines[1,2] and reflects the awareness of the data from the B4 study,[3] which showed a significant reduction in the recurrence of syncope in patients with abnormal EP study treated with pacemakers compared with a control group.

Our survey has also demonstrated a good adherence to guidelines regarding the use of pacemakers in undocumented reflex syncope with cardio-inhibitory response which is also in accordance with the guidelines for diagnosis and management of syncope.[4]

The current class I indications for CRT are based on several large randomized clinical trials,[5–8] and the results of our survey has shown

a clear adherence to these guideline recommendations in clinical practice. This may also reflect an improvement in the guidelines *per se* that are now perceived as clearer and easier to follow. In a previous similar survey[9] only one-third of the responding centres would implant a CRT device in patients with functional class NYHA II and more than half would require the additional criteria related to QRS morphology and width. This demonstrates the awareness of evidence from the REVERSE (REsynchronization reVErses Remodeling in Systolic left vEntricular dysfunction)[6] and MADIT CRT (Multicenter Automatic Defibrillator Implantation Trial Cardiac Resynchronization Therapy)[5] trials that have contributed to shape the current recommendations.

The importance given to both the QRS width and morphology in the decision-making process of which device to implant in HF patients is also reflected by the large number of centres that would use CRT in patients with non-LBBB and QRS >150 ms. Only 17% of the responding centres considered appropriate to implant a CRT in patients with non-LBBB and QRS between 120 and 150 ms which is consistent with the lower, Class IIb recommendation.

A surprising finding is that in patients in whom a CRT is not indicated due to narrow QRS morphology (<120 ms), 20% of the responding centres would choose not to implant any device at all despite primary prevention guidelines advocating ICD therapy in patients with reduced LVEF.[10]

No data are available from any large randomized clinical trial regarding the implantation strategy and follow-up of CRT patients, and therefore no clear recommendations have been proposed. In this survey, the majority of the centres would implant the LV lead in the posterolateral region or at a basal or mid-ventricular position of the anatomically most suitable venous branch of the coronary sinus. Both approaches find support in sub-analysis of data from some of the major randomized clinical trials. The REVERSE study has suggested that lateral placement of the LV lead is associated with better results in terms of reverse remodelling[11] and data collected from the MADIT CRT trial have demonstrated that apical placement of the LV lead is associated with less favourable outcome which, however, is not the case for a posterior or anterior LV lead position.[12] Only in a minority of cases, in this survey, the preferred approach for LV lead placement was targeting the region of latest mechanical activation. This approach is supported by several observations and by the results of the TARGET (Targeted Left Ventricular Lead Placement to Guide Cardiac Resynchronization Therapy) trial[13] which showed that positioning the LV lead at the latest activated region resulted in better echocardiographic and clinical response and less HF hospitalization. A possible explanation for the reluctance to systematically target the latest activated areas when placing the LV lead is that such a technique might be considered as more demanding for the implanting cardiologist and its advantages are yet to be proved in large randomized clinical trials.

Conclusions

In conclusion, the results of this survey show a good adherence to the most well-established indications in cardiac pacing and CRT but, as expected, a wider variation for indications that might be perceived as less established.

Acknowledgements

This document was set up, thanks to the unrestricted support of Medtronic; however, it has not been influenced in any way by its sponsor. The production of this EP wire document is under the responsibility of the Scientific Initiative Committee of the European Heart Rhythm Association: Carina Blomström-Lundqvist (chairman), Maria Grazia-Bongiorni (co-chair), Jian Chen, Nikolaos Dagres, Heidi Estner, Antonio Hernandez-Madrid, Meleze Hocini, Torben Bjerregaard Larsen, Laurent Pison, Tatjana Potpara, Alessandro Proclemer, Elena Sciaraffia, Derick Todd. A list of the Research Network centres can be found on the EHRA website. Document reviewer for EP-Europace: Irene Savelieva (St George's University of London, London, UK).

Conflict of interests: none declared.

Funding

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