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REVIEW ARTICLE

Benchmarking Belgian CRT practice against the rest of Europe: insights from the ESC-CRT survey II

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ABSTRACT

This subanalysis of the Euro-CRT survey II specifically focus on Belgian practice for CRT implantation. It explores Belgian adherence with the guidelines but also benchmark CRT practice in Belgium against the other European countries. Overall, Belgian management of CRT implantation is performed with great agreement with guidelines. This report could be used to provide guidance for both practical and economical approaches.

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CRT survey; resynchronisation therapy; cardiac device; heart failure; guidelines; CRT response

Introduction

The prospective and multicentric CRT Survey II was designed to describe the current clinical practice in CRT implantation across Europe [1].

A total of 42 ESC member countries participated and a total of 11.088 patients were included (Supplemental data Table 1). Eligible candidates were patients with an indication for de novo CRT. Exclusion criteria were previous CRT and/or generator replacement. Implants sites (overall $n = 288$) were asked to fill an electronic case report form (eCRF) during the inclusion period (from October 2015 to December 2016) for each consecutive patient implanted with a CRT. The eCRF consisted of demographics characteristics, pre- and per-implant data and short-term outcomes during the hospitalization [1].

The aim of the present subanalysis of the EURO-CRT II survey was to describe and benchmark the Belgian CRT practice against the rest of the European countries and current guidelines [2,3].

Method

Data were collected, managed and analysed by the Institut für Herzinfarktforschung Ludwigshafen (IHF). A web-based eCRF was used by each implanting centre to register informations on patients baseline characteristics, investigations, CRT per and post implantation procedures. Only patients with full complete data were considered for analysis.

Values are expressed as percentages or mean and standard deviation. *p* Values resulted from Chi-squared test or Mann–Whitney–Wilcoxon test

In the present subanalysis, we performed a selective comparison between the Belgian sample and the rest of the European cohort. In addition to the data analysed in the initial publication, we also compared the 'ScREEN score' between the different countries. The ScREEN score has been validated to predict CRT response, overall mortality and/or heart transplant [4]. It is based on five independent predictors of CRT response (female gender, estimated glomerular filtration rate $\geq$60 ml/min, QRS duration at baseline

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Supplemental data for this article can be accessed here.

(ECG) ≥150 ms, Ejection fraction ≥25% and NYHA class < III). One point is assigned per factor with a maximum of 5 points. The higher is the score, the higher is the rate of response.

Result

General data

Belgian enrolment ran from October 2015 to December 2016 and accounted for 2.4% of the CRT survey II population. Eight different centres participated to the study and reported data from 262 patients (Table 1). The rate of successful implantations (almost exclusively at first attempt) was similar between Belgium (93.9%) and all other countries (94.2%).

Belgian demographic data

Compared to the entire European cohort, the Belgian population presented a higher proportion of females (32.9% vs. 24.1%; $p = .001$), with a higher rate of non-ischemic cardiomyopathy (60.9% vs. 49.5%; $p < .001$), and less patients with a history of atrial fibrillation (AF; 34.5% vs. 41%; $p = .036$). Among AF patients, permanent AF was also less prevalent (25.8% vs. 42.7%). However, the mean age (68 years ± 10.6 vs. 68.6 ± 10.8; $p = .26$), the prevalence of diabetes (26.4% vs. 31.5%; p = ns), as well as chronic kidney disease (33.3% vs. 31.1%; p = ns), and a recent history of heart failure hospitalisation (49.6% vs. 46.4%; p = ns), were similar. Twenty-four percent of the Belgian cohort was previously implanted with a pacemaker, an ICD or a plugged CRT device. There were more elective procedures (92.2% vs. 76.6%; $p < .001$) and referrals from others centres (41.9% vs. 24.9%; $p < .001$) than in the other European countries (Table 2).

Table 1. Belgian centres participating to the Euro-CRT survey II.

Implanting centres	Patients entered
AZ Sint Jan (Brugge-Oostende av)	47
Centre Hospitalier Régional Namur (Namur)	19
Centre hospitalier universitaire UCL Namur (Godinne)	11
CHR de la Citadelle (Liège)	27
Cliniques Universitaires Saint-Luc (Brussels)	52
UZ -Gasthuisberg (Leuven)	58
Cliniques du Sud Luxembourg (ARLON)	10
Ziekenhuis Oost Limbourg (Genk)	38
	262

Table 2. Baseline characteristics.

Variable	Belgian CRT survey II cohort ($n = 262$)	CRT survey II total cohort ($n = 11{,}088$)	p Value*
Age	69 ± 11	69 ± 11	ns
Female gender (%)	32.9	24.1	.001
Non-ischemic cardiomyopathy	60.9	49.5	<.001
NYHA class	33.2	37.7	ns
LBBB morphology	79.1	72.6	.023
QRS duration ≥150 ms	63.8	68,7	ns
Permanent AF (%)	8.9	17,5	<.001

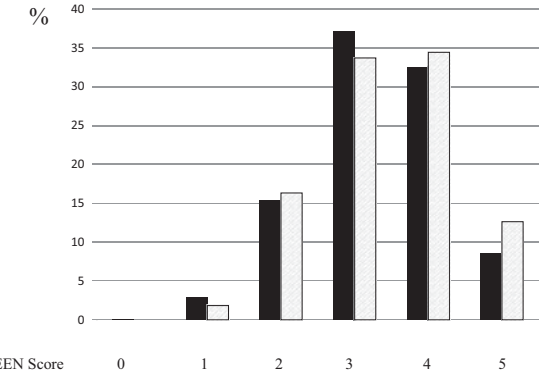
*Mann–Whitney–Wilcoxon test or Chi-squared test.

Probability of response to CRT

In the present subanalysis, we characterised the probability of response to CRT using the ScREEN score. The Belgian population presented a higher prevalence (48%) of patients with a high ScREEN score (≥4), and a very low prevalence (2%) of patients with a ScREEN score <2 (Graph 1). Baseline characteristics among the patients with a higher ScREEN score (≥4) included a majority of women (62%) with a normal GFR (92%), a QRS width ≥150 ms (63%) and a NYHA < III. Also, the Left ventricular ejection fraction in this population was ≥25% in 88% of the cases. Except for the group of patient with a ScREEN score > 5, the proportion of CRT-D and CRT-P was the same among the different categories, both in the entire cohort and in Belgium.

Pre-implant clinical evaluation and ECG

Similar to the global CRT-survey II results, one third of the Belgian group was in New York Heart Association (NYHA) functional class II. Natriuretic peptide (NT-proBNP) at baseline was increased (mean value: 5552 ± 7664 pg/ml vs. 5093 ± 8137 pg/ml; $p = .33$). At the time of implant, Belgian patients were more frequently in sinus rhythm compared to all other countries (78.5% vs. 69%; $p = .003$). The prevalence of Left bundle branch block (79.1%) was also superior to the results observed in the rest of European sample (72.6%; $p = .023$). However, the mean QRS duration (156 ± 25 ms) was similar between the Belgian cohort



Graph 1. Proportion of patients according to ScREEN Score in ESC countries (black bars) compared to Belgium (white bars).

Table 3. Cardiac resynchronisation therapy implantation procedure.

	Belgian cohort ($n = 257$)	CRT survey II total cohort ($n = 10,843$)	p Value*
Successful implantation (%)	97	97	ns
CRT-D implanted (%)	69	70	ns
Duration of the procedure (min)	112 ± 54	100 ± 46	<.001
Mean fluoroscopy time (min)	19 ± 13	18 ± 17	.009
Coronary venogram to guide LV implantation (%)	96	91	.019
Phrenic nerve stimulation performed (%)	92	90	ns
LV lead position optimised (electrical delay such as QLV or QRS width) (%)	50	33	<.0001
Complications (%)	6	6	ns

*Mann–Whitney–Wilcoxon test or Chi-squared test.

and the rest of the European population. The prevalence of QRS > 150 ms was 43% and also comparable to the entire cohort. Mitral regurgitation (moderate or severe) was present in more than one third of the Belgian cohort.

Clinical indications for CRT

In the Belgian population, 51.2% of our patients had at least a Class I indication for CRT based on a poor LV EF (EF < 35%) and wide QRS > 150 ms (vs. 60.2%; $p = .004$). Also, 50.8% had a Class I indication for CRT at the time of ICD implant (vs. 47.8%; $p = .34$). Finally, 16.5% presented a Class II indication for de novo CRT in the context of high expected RV pacing (vs. 23%; $p = .015$). In addition and compared to European practice, mechanical dyssynchrony (based on echocardiographic parameters markers) at baseline was more often documented by Belgian physicians (29.1% vs. 11.1%; $p < .001$). Pre-implant imaging techniques used to refine CRT indications differed somehow in Belgium (with a more frequent use of cardiac magnetic resonance, 25% vs. 9%; $p < .001$). In terms of Left ventricular dysfunction, the prevalence of LV EF > 35% was 11% (similar to the rest of the cohort).

CRT implants procedures

Similar to the European cohort, successful CRT implantations were achieved in 97% of cases with a CRT- D being implanted in 69% of the cases. Belgian operators were most of the time electrophysiologists (66.3%) but also heart failure physicians (21.7%), surgeons (10%) and invasive cardiologists (2%). Duration of the procedure was slightly longer (112 ± 54.1 min vs. 100 ± 46 min; $p < .001$) with a mean fluoroscopic time of 19.0 ± 13.4 min (vs. 17.7 ± 17.2 min; $p = .01$; Table 3). This longer operating and fluorocopic times reflect probably the systematic, more prevalent, use of coronary venogram to guide LV lead implantation in Belgium compared to the other countries. RV lead was implanted first (96%) and positioned at RV apex in 87% of patients. LV lead placement was successful in 98% of patients with only 4% being finally implanted epicardially, which was significantly less than the 9% of the global cohort ($p = .03$). Nonsuccessful LV lead implantation occurred in five patients. The reasons for failure to implant the LV lead were anatomical (non-suitable vein) and technical difficulties to identify the coronary sinus. Multipolar LV lead was more often implanted than bipolar when compared to the other countries. For half of the patients, the positioning of the LV lead was optimised by measuring electrical delays (QLV [5] or QRS width).This practice was significantly more prevalent in Belgium when compared to the rest of the European countries (50% vs. 33%; $p < .001$).

Complications

Peri-procedural complications rate was equivalent (6%) in Belgium and in the other European countries (6%; $p = .95$) with pneumothorax (four patients) and coronary sinus dissection (three patients) being the most commonly reported. One peri-procedural death occurred in Belgium (7 for the all cohort; $p = .06$). During the hospital stay, 3.8% of the Belgian population presented a major adverse event: myocardial infarction (one patient), acute infection (one patient), worsening heart failure (one patient), arrhythmia (five patients). Ten additional patients necessitated a redo procedure for lead dislodgement (eight patients, 3.1%), or phrenic nerve stimulation (two patients, 0.8%)

Device programming and follow-up

The mean hospital stay was 4.4 ± 5.2 days, which was by 2 days shorter than the rest of Europe (6.4 ± 1.5 days; $p < .001$). Programming optimisation was performed most of the time using automated algorithms embedded in the device. Compared to the European sample, Belgian patients were more often recruited from private practice centres, implanted in

community hospital and less frequently referred to university or teaching hospitals for the implant procedure. Follow-ups were more equally distributed within the different kind of facilities. Also, device remote monitoring, along with the conventional follow-up, was more often offered to the Belgian patients when compared the global cohort (30%; $p < .001$).

Discussion

EuroCRT Survey II provided a summary of current clinical practice in CRT implantation among ESC member's countries. Belgian practice appeared to be similar to the others ESC states by many points, including the rate of procedural success and complication. Nonetheless, there were relevant differences, in particular in terms of candidate's selection (with a higher proportion of female, LBBB and fewer atrial fibrillation and ischaemic cardiomyopathy). Overall, the Belgian cohort emerged as a well selected population characterised by a high probability of response to CRT, which is highlighted in this subanalysis by a higher prevalence of high ScREEN scores. This higher probability of response to CRT is possibly explained by the particular conditions of reimbursement in Belgium. For instance, CRT implant in patients with a narrow QRS or a QRS $<$ 150 ms but without evidence of mechanical dyssynchrony was theoretically not allowed. Also, for the clinical decision- making, the choice of a CRT-D in primary prevention was restricted to patient with left ventricular EF $<$35%.

In this context, it is surprising that no association between the probability of response to CRT and the type of device (CRT-P or CRT-D) was found, except for the group of patient with a very good probability of response to CRT (ScREEN score $\geq$5). In this subgroup, 55% of the Belgian patients received an ICD, whereas 71% of the same subgroup had an ejection fraction $\leq$ 35% (allowing, thus, or the reimbursement of a defibrillator in primary prevention), and only 18% had an ischemic cardiomyopathy. The clinical decision making between a CRT-p and a CRT-d appeared thus to results not only from the reimbursement conditions but also form an effort from the operators to analyse individual probabilities of response to CRT and risk of arrhythmias.

If the benefit of a defibrillator in primary prevention in patients indicated to a CRT has been initially supported by large trials (MADIT-II [6], SCD-HeFT [7]) in nonselected populations, recent nonrandomised studies [8] questioned the benefit of the ICD in the subgroup of non-ischemic cardiomyopathies. Up to date, there is still no randomised evidence of the benefit of the ICD in this subgroup of patients (especially in those with a high probability of response to CRT). The ongoing RESET-CRT [9] clinical trial randomises heart failure patients with LVEF $<$35% and a CRT indication to either CRT-D or CRT-P implantation. This first randomised study with a direct comparison between the two therapeutic options might comfort the Belgian current practice and the future conditions of reimbursement.

Conclusion

This report on Belgian clinical practice for CRT implantation provides a positive feedback for both operators and clinicians and could be useful to improve experience and adherence to the guidelines.

Disclosure statement

No potential conflict of interest was reported by the authors.

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