Mini Review

Implantable cardioverter defibrillator in patients with chagas disease

Introduction

The most frequent cause of death worldwide is cardiovascular disease, and approximately half of these occur suddenly. In patients with ischemic heart disease is the most common form of death (more than 50%), being the first symptom in 19-26% of cases.[1] The implantable cardioverter defibrillator (ICD) is one of the main options for the prevention of sudden cardiovascular death in the world, the most frequent indication is primary prevention in patients with previous infarction or dilated cardiomyopathy and systolic ventricular dysfunction. This indication is based mainly on the results of two large clinical trials: the MADIT II[2] and SCD-HeFT[3] studies. Regarding secondary prevention, the support of the indication is according to the results of the AVID, CIDS, CASH works, where the majority had coronary disease.[4] According to the World Health Organization with figures from March 2016 it is estimated that there are between 6 and 7 million people in the world infected with *Trypanosoma cruzi*, most of them in Latin America. 30% of chronic patients have heart disease, of which 10% progress to the dilated form.[5] The international recommendations for the implantation of ICD as primary prevention indicate it in patients with ventricular dysfunction or parietal dyskinesias associated with unclear syncope with ventricular tachycardia/inducible atrial fibrillation in the electrophysiological study, regardless of the hemodynamic tolerance. In the case of secondary prevention, it is indicated in surviving patients of cardiac arrest secondary to ventricular fibrillation or ventricular tachycardia with poor hemodynamic tolerance after identifying the cause of the episode and ruling out reversible causes. The high incidence of sudden death as a result of Chagas' cardiomyopathy leads to the need to emphasize its identification and treatment. The introduction of ICD has ushered in a new era in the treatment of arrhythmias. Its progressive development, ease of implantation and versatility in programming have made it a therapeutic tool every day more beneficial. Do they present differences regarding demographic characteristics, implant reasons, type of therapies and mortality among patients with ICD and necrotic ischemic cardiomyopathy compared to Chagasic?

Objetives

Knowing the demographic characteristics, causes that led to the placement of the CDI, morbimortality in both groups, type of therapies and time at the beginning of them.

Materials and methods

a. Retrospective, observational, cross-sectional, comparative, unicentric study, with consecutive inclusion of 76 patients with ICD placement from January 2009 to September 2016, with the use of a computerized medical history and database of the Cardiology Service.

b. Inclusion criteria—patients with ischemic-necrotic and chagasic cardiomyopathy to whom CDI was implanted.

c. Exclusion criteria—patients without ICD implantation and those who were implanted CDI with myocardiopathies different to ischemic-necrotic and chagasic.

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d. Statistical analysis—The qualitative variables were expressed as percentages and in the bivariate analysis of the associated factors the proportions were compared with the Chi-square or Fisher test according to assumptions and expected frequencies.

e. The quantitative variables were analyzed with the normality tests of Shapiro-Wilk, those with normal distribution were expressed as mean and standard deviation; those with non-Gaussian distribution as median and interquartile range and analyzed from the T test or nonparametric test as appropriate.

f. In all cases, values of $P < 0.05$ were considered significant.

g. For the statistical analysis, the SPSS 2.0 program was used.

Results

1. Out of a total of 76 patients with ICD placement, 53.9% had necrotic ischemic cardiomyopathy (G1), 46.1% chagasic cardiomyopathy (G2) and 11.4% the combination of both.

2. The mean age was 66.8 ($\pm$ 8.27) years in G1 and 69.63 ($\pm$ 8.38) years in G2; male sex 38.2% G1 and 31.6% G2. There were no significant differences in most of the cardiovascular risk factors of both groups (Table 1).

3. Left ventricular systolic function (LVEF) was preserved in 31.7% of G1 compared to 14.3% G2 (p=0.075). Moderate depression of LVEF was present in 2.4% G1 versus 25.7% G2 (p=0.03). While severely impaired LVEF, 63.4% G1 and 57.1% G2 were observed without statistically significant differences (p >0.05) (Figure 1).

4. As for the electrocardiogram, sinus rhythm was observed in 87.8% G1 and 80% G2, rhythm of atrial fibrillation in 9.8% G1 versus 8.6% G2, rhythm of pacemaker 7.3% G1 and 17.1% G2. Different conduction disorders were recorded as complete left bundle branch block in 24.4% G1 versus 20% G2; complete block of right branch 7.3% G1, 31.4% G2 and left anterior hemiblock 17.1% of Chagasic, both with significant differences (Table 2).

5. The implant was secondary prevention in 78% G1 and 71.4% G2. The main causes of implantation were: aborted sudden death

15.6% G1 and 16% G2, sustained monomorphic ventricular tachycardia 50% G1 and 56% G2. (p> 0.05).

6. For primary prevention: syncope 22.2% G1, 30% G2, non-sustained monomorphic ventricular tachycardia 11.1% G1, 0% G2, induction of complex ventricular arrhythmia in electrophysiological study 11.7% G1 and 10% G2. (P >0.05).

7. One patient within the group of necrotic ischemic cardiomyopathy with severe impairment of LVEF also had a resynchronizer with a favorable response.

8. They were under treatment with amiodarone 70.7% G1 and 80% G2; and with beta-blockers 80.5% G1 and 74.3% G2 (Table 3).

9. 24.4% G1 and 40% G2 had effective crashes.

10. The median time to the first effective shock was 47 (5-72) months G1 and 24 (2-55) months G2. (p >0.05). Spurious shocks only in chagasic patients 7.1% (Table 4).

11. 14.6% G1 and 17.1% G2 had effective pacing (Figure 2).

12. The median time to the first effective pacing was at 4 (1.5-8.5) months G1 and at 29.5 (3.25-64) months G2 (p >0.05).

13. According to the New York Heart Association (NYHA) functional classification, patients were in Functional Class (FC) I / II 24.4% G1 and 34.3% G2, and in FC III/IV 17.1% G1 and 25.7% G2. (P >0.05) (Table 5).

14. Mortality was 29.3% G1 and 17.1% G2. The causes were of infectious origin in 50% G1 and 33.3% G2, of cardiovascular origin 25% G1 and 66.7% G2 and death by other causes in 25% of G1 (p >0.05) (Table 6).
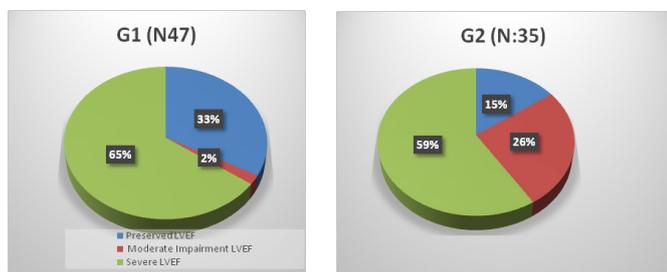

Figure 1 Chart of cakes comparing left ventricular systolic function (LVEF) among patients with myocardiopathy of ischemic-necrotic origin (G1) versus patients with chagasic cardiomyopathy (G2). In both groups, LVEF with severe deterioration predominates. With a higher percentage of LVEF preserved in G2.
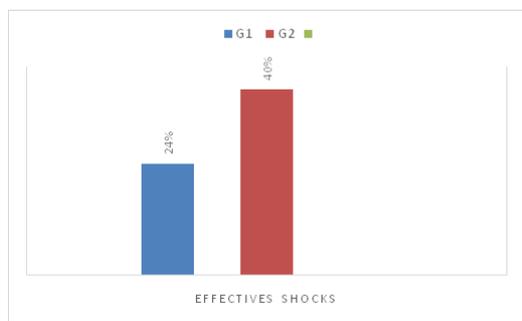
Figure 2 Bar chart that compares the percentage of effective crashes in each group. A predominance is observed in the Chagasic myocardiopathy group (G2).

Table 1 Demographic characteristics: cardiovascular risk factors

Total 78	G1 (N 41)	G2 (35)	P
Age	66.8 years +/- 8.27	69.63 years +/- 8.38	0.144
Male Sex	69.7%	68.6%	0.838
Hipertention	78%	77.1%	0.925
Diabetes	22%	14.3%	0.39
Smoking	14.6%	5.7%	0.275
Former Smoking	31.7%	22.9%	0.39
Dyslipidemia	68.3%	28.6%	0.001
Hypothyroidism	22%	22.9%	0.925

Table 2 Demographic characteristics: electrocardiogram

Total 78	G1 (N41)	G2 (N35)	P
Sinus rhythm	87.8%	80%	0.352
atrial fibrillation	9.8%	8.6%	0.589
pacemaker rhythm	7.3%	17.1%	0.167
Complete blocking of right branch	7.3%	31.4%	0.007
Complete blocking of left branch	24.4%	20%	0.647
left anterior hemiblock	0%	17.1%	0.007

Table 3 Demographic characteristics: pharmacological treatment

Total 78	G1 (N 41)	G2 (N35)	P
Aspirin	56.10%	14.30%	0
Statins	61%	42.90%	0.115
Beta blockers	80.50%	74.30%	0.518
Amiodarone	70.70%	80%	0.352
Antialdosteronics	48.80%	48.60%	0.985
Oral anticoagulants	14.60%	14.30%	0.966
Calcium blockers	9.80%	8.60%	0.589
Clopidogrel	19.50%	5.70%	0.74
Levothyroxine	12.20%	17.10%	0.541
Angiotensin-converting enzyme inhibitors	51.20%	45.70%	0.632
Aldosterone receptor antagonists	9.80%	20%	0.206
Furosemide	34.10%	22.90%	0.279
Digoxin	4.90%	2.90%	0.56

Table 4 Time (median) at the first shock

	G1 (N:18)	G2 (N:30)
Median Time at first Schock in Months	47 (5-72)	24 (2-55)

Citation: Florencia MM, Pablo A, Lucas SL, et al. Implantable cardioverter defibrillator in patients with chagas disease. *J Cardiol Curr Res.* 2018;11(6):246–248. DOI: 10.15406/jccr.2018.11.00410

Table 5 Demographic characteristics: Functional class according to NYHA scale

Total 78	G1 (N41)	G2 (N35)	P
Funtional Class I/II	24	34	0.357
Funtional Class III/IV	17	25	0.357

Table 6 Mortality from different causes

Total 78	G1 (N:49)	G2(N:35)
Total Mortality	29% àN:12	17% à N:6
Death from cardiovascular cause	25%	66.70%
Death of infectious cause	50%	33.30%
Unknown cause of death	16.70%	0%
Other causes of non-cardiovascular death	8.30%	0%

Discussion

a. The implantation of the ICD both for primary and secondary prevention in carefully selected patients has shown through studies already mentioned the benefit in decreasing mortality. However, the costs involved in implementing this strategy are not always available to patients. Both public and private health present, on occasions, difficulties to make such treatment possible.

b. In our study, which was conducted in a public hospital in the Province of Buenos Aires, it documented numerous characteristics of the population that was taken as a sample, as well as the reason for the indication of the device and the evolution of the disease according to both groups.

c. Chagasic patients had effective crashes before the ischemic-necrotic ones. Although there were no differences in terms of mortality, the possibility of the occurrence of these arrhythmic events before in patients with Chagas puts us on alert when it comes to the indication of ICD.

d. In contrast to all the aforementioned, the results of our study showed a low incidence in the indication for primary prevention in both groups. This happens because the system does not provide or delay the necessary means to implement this method. More complex situation occurs in chagasic patients, in whom the indication as primary prevention is not so firm.

e. Study limitations: We can mention the inclusion of a low number of patients.

f. However, we consider it important to continue investigating, in a multicentric manner, the subject in order to improve the survival of patients with the described pathology.

Conclusion

The main indication for ICD implantation in both groups was secondary prevention. No differences were found in effective shock or pacing therapy. The time to effective shock that aborted complex ventricular arrhythmias was lower in Chagasic patients. There were no differences in mortality.

Acknowledgments

Conflicts of interest

Author declares no conflicts of interest.

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