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ORIGINAL RESEARCH ARTICLE

Implantation of permanent pacemakers in Cuenca–Ecuador, from 2017 to 2018

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ABSTRACT

Introduction: In recent years, the placement frequency of permanent pacemakers has increased due to some risk factors, some of which are carried out through cables. **Objective:** To determine the prevalence and related factors of permanent pacemaker implantation in adult patients in the cardiology department of José Calasco Artega hospital in 2017. **Methods:** a randomized cross–sectional study was conducted on 422 patients over 18 years old in the cardiology department of "José Carrasco Arteaga" hospital in Cuenca, Ecuador from January to December 2017. Information is processed in SPSS software version 24. Descriptive statistical analysis based on frequency and percentage was used to measure the statistical correlation with odds ratio (or) within 95% confidence interval. When $p<0.05$, it was considered to be statistically significant. **Results:** The implantation rate of cardiac pacemaker was 7.1%, and the average age was 65.52 years (DS±14.77), mainly male. The risk factors associated with pacemaker implantation were atrioventricular block or 42.56 (95% confidence interval: 16.06–112.73, p=0.000); Sinoatrial node disease or 59.34 (95% CI: 11.67–301.93, P=0.000) and others or 0.017 (95% confidence interval: 0.00–0.05, p=0.000). Atrial fibrillation was not statistically significant or 1.71 (95% confidence interval: 0.62–4.71, p=0.354). **Conclusion:** The prevalence of pacemaker implantation is 7.1%, which is related to atrioventricular block, which is the main risk factor, followed by nodular diseases.

Keywords: pacemaker; prevalence; risk factors

1. Introduction

At present, the use of permanent pacemakers has increased in recent years, secondary to various risk factors, some of which are modicable[1]. This is a medical procedure implemented since the 1950s. At present, it has completely changed the management of some diseases through minimally invasive technology and low complication rate[2].

Unlike developing countries without specific data, the frequency of implementation in developed countries is 200 to 1000 per million inhabitants[3]. Previous studies have shown that the most common cause of implantation is still conduction disorder, of

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which the most prominent 85% are sinoatrial node dysfunction and complete atrioventricular block[4,5]. In developed countries such as the United States and Europe, the prevalence of pacemaker implantation is 30% to 50%[4]; According to the records of the Spanish Society of Cardiology in 2017, this proportion in Spain is 32.1%, so it is still a globally representative problem[5].

In Ecuador, Dr. Abel Gilbert Ponton of Guayaquil specialized hospital conducted a study. In 2017, Izaguirre S determined 15% of the prevalence of pacemaker implantation through his research[6].

2. Materials and methods

A cross–sectional and retrospective study was conducted by reviewing the clinical history of the AS400 system in José Carrasco Arteaga hospital and collecting information using a form pre- established by the author. The sample consisted of 422 patients over the age of 18, who were randomly selected and met the inclusion criteria.

The information is processed by SPSS version 24 (Windows statistical product and service solution). Descriptive statistics is used for analysis to determine the absolute frequency and percentage. The statistical correlation and odds ratio (or) are measured within the 95% confidence interval. When $p<0.05$, it is considered to be statistically significant.

3. Results

Among the adults treated in the cardiology department of "José Carrasco Arteaga" hospital, the pacemaker implantation rate was 7.1%; 5.2% were carriers and 88.7% were not implanted (**Figure 1**). As for the sociodemographic variables of pacemaker implantation, 266 men (63.0%) were dominant, of which 5.7% were implanted with permanent pacemakers. The average age was 65.52 ± 14.77 years, including 223 elderly (52.9%) and 22 permanent pacemaker implants (5.2%). 322 cases (76.3%) were urban residents. According to marital status, the most common group was 286 (67.8%). The main education was 177 people (41.9%) in primary school, of which 16 (3.85%) received permanent pacemaker implantation. Finally, the most common occupation is 164 retirees (38.9%), of which 19 (4.5%) need to install such equipment. (**Table 1**).

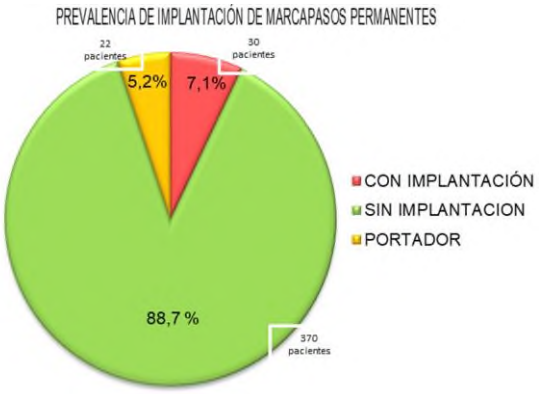

Figure 1. XRD Prevalence of permanent pacemaker implantation. José calasco altega hospital, 2017.
Source: database. Editor: Author

Atrioventricular block and permanent pacemaker implantation or 42.56 (95% confidence interval: 16.06–112.73 $p<0.001$); Sinoatrial node disease or 59.34 (95% confidence interval: 11.66–301936; $P<0.001$). Unlike atrial fibrillation, atrial fibrillation was not statistically significant or: 1.71 (95% confidence interval 0.62–4.71, $P=0.354$). Although according to our study, other categories and our study were interpreted as the protective factor or 0.017 (95% CI 0.00–0.08), this phenomenon only applies to the placement of these devices, not to the progression of cardiac structural diseases (**Table 2**).

Table 1. Prevalence of permanent pacemaker implantation. José Calasco Altega hospital, 2017

Variable	Implantation of yes	Pacemaker not	Carrier	Total	Total
Gender					
Female	6 (1.4%)	145 (34.4%)	5 (1.2%)	156 (37.0%)	0.574
Male	24 (5.7%)	225 (53.3%)	17 (4.0%)	266 (63.0%)	
Age * year					
18–39	0 (0.0%)	30 (7.1%)	(0.5%)	32 (7.6)	
40–64	8 (1.9%)	149 (35.3%)	10 (2.4%)	167 (39.6%)	0.003
Over 65	22 (5.2%)	191 (45.2%)	10 (2.3%)	223 (52.9%)	
Residence					
Countryside	10 (2.4%)	88 (20.9%)	2 (0.5%)	100 (23.7%)	0.046
Urban	20 (4.7%)	282 (06.8%)	20 (4.7%)	322 (7(5.3%)	
Marital status					
Single	2 (0.5%)	28 (6.6%)	2 (0.5%)	32 (7.0%)	
European Union of banks for reconstruction and development	0 (0.0%)	8 (1.9%)	0 (0.0%)	8 (1.9%)	
Married	18 (4.3%)	251 (59.5%)	17 (4.0%)	286 (67.8%)	0.152
Divorced	2 (0.5%)	26 (6.2%)	0(0.0%)	28 (6.6%)	
Widower	8 (1.9%)	57 (13.5%)	3(0.7%)	68 (10.1%)	
Teaching level					
Illiteracy	0 (0.0%)	8 (1.9%)	0 (0.0%)	8 (1.9%)	
Primary	16 (3.8%)	153 (36.3%)	8 (1.9%)	177 (41.9%)	0.235
Secondary	9 (2.1%)	121 (28.6%)	7 (1.7%)	137 (32.5%)	
Superior	5 (1.2%)	88 (20.8%)	7 (1.6%)	100 (23.7)	
Eye movement					
Student	0 (0.0%)	3 (0.7%)	0 (0.0%)	3 (0.7%)	
Public Dependent	0 (0.0%)	220 (5.2%)	1 (0.2%)	23 (5.5%)	
Private teeth	2 (0.5%)	40 (9.5%)	3 (0.7%)	45 (10.7%)	0.382
Uncorrelated	7 (1.7%)	100 (23.7%)	6 (1.4%)	113 (26.8%)	
Retired	19 (4.5%)	136 (32.2%)	9 (2.1%)	164 (38.9%)	
None	2 (0.5%)	69 (16.4%)	(0.7%)	74 (17.5%)	

Table 2. Factors related to permanent pacemaker implantation. José calasco altega hospital, 2017

Related factors	Implantation of yes		Pacemaker not		OR	95% confidence interval		P value
	N=30	%=7,1	N=392	%=92,9				
AV block								
Yes	15	3.55	9	2.1	42.56	10.06	112.73	0,000
No	15	3.56	383	90.8				
Sinus node								
Yes	7	1.66	2	0.5	59.34	11.67	301.93	0,000
No	23	5.45	390	92.4				
Atrial fibrillation								
Yes	5	0.7	41	9.7	1.71	0.62	4.71	0,354
No	25	6.4	351	83.2				
Other								
Yes	3	0.71	340	80.6	0.017	0.00	0.05	0,000
No	27	6.40	52	12.3				

4. Discussion

Our study showed that the prevalence of permanent pacemaker implantation was 7.1%, similar to the study conducted by Pellegrini C et al. In Germany in 2018, which showed that 9.9% of patients used this pacemaker[7], which may be due to the prevalence of cardiogenic diseases, including those risk factors indicating pacemakers.

At the national level, the Izaguirre study conducted in Guayaquil, Ecuador, in 2016 found that the prevalence of pacemaker implantation was higher, at 15%. This may be because the complexity and solving ability of this hospital are higher, so the number of cases is more, not to mention that this population has similar socio demographic characteristics with the population we studied.

Based on the sociodemographic variables analyzed, it was observed that:

More than half of the study samples were 266 men (63.0%), of which 24 (5.7%) were implanted with pacemakers; Similar to the study of Ruiz e.et al., Peru in 2015, 64% of them are men, which may be because men are more prone to cardiovascular disease[8].

Permanent pacemaker implantation was most common in 223 people over 65 years old (52.9%); Pacemakers were implanted in 22 cases (5.2%); Like the 2009 study of Femenia F et al. In Argentina, the study found that the prevalence of pacemaker implantation in the age group over 65 increased by 59.89%, This may be because risk factors and the likelihood of progression of these diseases increase with age.

In terms of marital status, 286 (67.8%) were married and 18 (4.3%) were implanted with pacemakers; This result was confirmed by Diaz m et al. In Quito, Ecuador in 2015, 56% of patients were married[9].

According to occupation, 164 patients (38.9%) were retired patients, of which 4.5% were implanted with pacemakers; This was followed by 1.7% in the independent group and 0.5% in the private dependence group.

The above research shows that for pacemaker implantation, they must meet some standards recognized by the European clinical practice guidelines for pacemaker and cardiac resynchronization therapy.

In our study, we observed association with atrioventricular block or 42.56 (95% confidence interval: 16.06–112.73, P=0.000), similar to the results of international studies, which confirmed this statistically significant association (or 9.95% CI: 2.30–42.95 p value 0.002 (P=0.057)[10,11]. Sinoatrial node disease or 59.34 (95% confidence interval: 11.67–30.1936 P=0.000) established this association and considered it a risk factor, which is consistent with the study conducted by Fernandez and collaborators in Buenos Aires, Argentina or 2.09 (95% CI 1.09–3.07 P=0.025[10,11]).

According to our study, atrial fibrillation was considered a risk factor[12] (or 1.71; 95% CI: 0.62–4.71), but it was not statistically significant (P 0.354). Cosedis et al. Confirmed this in the 2012 study in the United States, which pointed out that the initial treatment of atrial fibrillation is drug treatment and ablation (P=0.007), and pacemaker implantation is the last treatment measure[13].

5. Conclusions

The prevalence of pacemaker implantation is 7.1%, which is related to atrioventricular block, which is the main risk factor, followed by nodular diseases.

Conflict of interest

The authors declare no conflict of interest.

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