

## Analysis of the Frequency of Cardiac Arrhythmias and Conduction Disturbances From a Health-Care Perspective

Eduardo Vázquez Ruiz de Castroviejo, Juan Muñoz Bellido, Cristóbal Lozano Cabezas, Antonio Ramírez Moreno, Manuel Guzmán Herrera, Ada Tarabini Castellani, Antonio Fajardo Pineda, Blas Jiménez Araque, Juan B. Armenteros Lechuga, and Carlos Pagola Vilardebó

Servicio de Cardiología, Complejo Hospitalario de Jaén, Jaén, Spain.

**Introduction and objectives.** Over the last few years, our understanding of the mechanisms underlying cardiac arrhythmias has increased substantially. However, few data on their prevalence exist. Our objectives were to analyze the prevalence of cardiac arrhythmias and conduction disturbances in cardiology clinic outpatients and to determine the number of patients with a class-I or -IIa recommendation for electrophysiological studies (EPS).

**Patients and method.** We investigated cardiac arrhythmias and conduction disturbances in 2045 patients and determined their prevalence in those seen for the first time. Specific conditions investigated included supraventricular and ventricular arrhythmias, ischemic disease with an ejection fraction (EF) <30%, second-degree or higher atrioventricular (AV) block, intraventricular block, and sick sinus syndrome.

**Results.** In total, 798 (39%) of all patients and 153 of the 704 (22%) seen for the first time presented with 1 or more of the specified conditions. Their distribution in all patients was: atrial fibrillation, 524 (26%); atrial flutter, 34 (2%); narrow-QRS tachycardia, 58 (3%); ventricular arrhythmias or EF<30% due to ischemic disease or both, 46 (2%); AV block or sinus dysfunction, 68 (3%); intraventricular block, 157 (8%); and other conditions, 4 (0.2%). Some 7% (143/2045) of all patients and 3.5% (25/704) of those seen for the first time had an indication for EPS.

**Conclusions.** *a)* Almost 40% of all patients seen in a cardiology outpatient clinic and 1 in 4 of those seen for the first time presented with a cardiac arrhythmia or conduction disturbance, and *b)* more than 3% of patients seen for the first time had an indication for EPS.

**Key words:** *Arrhythmia. Heart block. Electrophysiology.*

Correspondence: Dr. E. Vázquez Ruiz de Castroviejo. Navas de Tolosa 4, P 1, 6.º D. 23003 Jaén. España. E-mail: vazquez89@arrakis.es

Received October 22, 2004  
Accepted for publication March 18, 2005.

### **Análisis de la frecuencia de las arritmias cardíacas y de los trastornos de conducción desde una perspectiva asistencial**

**Introducción y objetivos.** Durante los últimos años hemos asistido a un importante avance en el conocimiento de los mecanismos de las arritmias que no ha ido acompañado de un desarrollo paralelo en el conocimiento de su prevalencia. El objetivo es analizar la frecuencia de las arritmias y los trastornos de conducción cardíacos en una consulta de cardiología general, así como determinar el número de pacientes con indicación de clase I o IIa en el estudio electrofisiológico (EEF).

**Pacientes y método.** Analizamos la presencia de arritmias y alteraciones de la conducción en 2.045 pacientes. Determinamos la incidencia de estas enfermedades en los pacientes que consultaban por primera vez. Incluimos las arritmias supraventriculares o ventriculares, a los pacientes isquémicos con fracción de eyección (FE) < 30%, los bloqueos auriculoventriculares > de primer grado, bloqueos intraventriculares completos y la disfunción sinusal.

**Resultados.** En 798 (39%) de todos los pacientes y en 153 (22%) de los 704 que consultaban por primera vez se observaba una o más de las enfermedades analizadas. La distribución, entre todos los pacientes, era la siguiente: fibrilación auricular, 524 (26%); aleteo auricular, 34 (2%); taquicardia con un complejo QRS estrecho, 58 (3%); arritmias ventriculares y/o FE < 30% de origen isquémico, 46 (2%); bloqueos auriculoventriculares o disfunción sinusal, 68 (3%); bloqueos intraventriculares, 157 (8%); otros, 4 (0,2%). El 7% (143/2.045) de la totalidad de los pacientes y el 3,5% (25/704) de los que consultaban por primera vez tenían indicación de EEF.

**Conclusiones.** *a)* Casi un 40% de todos los pacientes atendidos en una consulta de cardiología general y 1 de cada 4 que consultan por primera vez presentan arritmias cardíacas o trastornos de conducción, y *b)* más de 3 de cada 100 pacientes derivados por primera vez tienen indicación de EEF.

**Palabras clave:** *Arritmia. Bloqueo cardíaco. Electrofisiología.*

**ABBREVIATIONS**

AF: atrial fibrillation.  
 AV: atrioventricular.  
 EF: ejection fraction.  
 EPS: electrophysiological study.

**INTRODUCTION**

Cardiac arrhythmias and conduction disturbances constitute a major group of heart diseases. Over the past 15 years, we have observed spectacular advances in our knowledge of arrhythmogenic substrates and of the mechanisms that trigger and contribute to the maintenance of arrhythmias, as well as the development of therapeutic approaches and implantable devices that have revolutionized the management of these diseases. However, with the exception of atrial fibrillation (AF), which has been the subject of numerous population-based studies that enable us to estimate the true frequency of this arrhythmia,<sup>1-4</sup> there has been no parallel development in the knowledge of the prevalence and incidence of the rest of these diseases. Due to the lack of information, the real importance of the problem and the demands of the management of these diseases continues to be little known from the point of view of the population and health care in terms of both the allocation of material and human resources and the devising of training programs for specialists.

The objective of our study was to analyze the incidence (existing and newly diagnosed cases) of cardiac arrhythmias and conduction disturbances in a general cardiology clinic. We also proposed to determine the percentage of our patients who require referral to units specialized in the management of arrhythmias because of evidence that they might benefit from an electrophysiological study (EPS) and/or device implantation.

**PATIENTS AND METHODS**

We analyzed the rhythm or conduction disturbances in 2045 patients who came to the cardiology outpatient clinic of our center on those days on which the authors responsible for data collection (Drs Vázquez and Muñoz) were present. This situation was conditioned exclusively by organizational aspects of the unit and in no case by clinical considerations; thus, the sample was representative of the patients that come to our clinics. These patients are sent to us from primary care centers, for consultations requested by other hospital services and for check-ups scheduled by the cardiologists themselves. All the cardiology units in the health care area of our center depend on our service. Thus, the only means of being referred to cardiology from

primary care is through our outpatient clinic. Moreover, none of our units are devoted exclusively to a given heart disease. As we have no electrophysiology laboratory in our hospital, we have to refer patients to other centers; however, all of them continue to be followed in our clinic, although some of them are being seen simultaneously at their hospitals of origin, mainly for monitoring of implanted devices. If a patient came to our clinic more than once during the period of data collection (November 2003 to June 2004), only the first visit was considered.

In addition to the analysis of the presence of arrhythmias and conduction disturbances in all the patients enrolled, we determined the prevalence of these diseases in the 704 patients (34.4%) who were being assessed in a cardiology clinic for the first time.

A patient was considered to present an arrhythmia when the in-office electrocardiographic recording, that provided by the patient or the Holter recording revealed any of the following rhythm disturbances: AF, common atrial flutter, regular narrow QRS tachycardia with no evidence of common atrial flutter, and sustained or nonsustained ventricular tachycardia. Ventricular tachycardia was considered to be any regular tachycardia with a wide QRS complex or one that differed from that of baseline rhythm and sustained tachycardia was that which lasted more than 30 seconds or required termination by means of some type of therapeutic technique. We included in the analysis those patients with an ejection fraction (EF) less than 30% due to ischemic disease, even in the absence of arrhythmias, as we considered that they should be assessed from the perspective of the prevention of arrhythmia-induced sudden death. Those patients with supraventricular or ventricular premature beats, regardless of their frequency, were excluded and those presenting frequent, highly symptomatic ventricular premature beats and requiring drug treatment were included only exceptionally. Atrial fibrillation was classified according to the clinical patterns established in the joint document of the American Heart Association, the American College of Cardiology and the European Society of Cardiology.<sup>5</sup>

The presence of second-degree or higher grade atrioventricular (AV) block, bifascicular block, or complete right bundle branch block was considered a conduction disturbance. Patients with sick sinus syndrome were also included. We established as a possible indication for EPS and/or device implantation a clinical picture compatible with class I or IIa recommendations according to any of the clinical practice guidelines of the American cardiology associations, the European Society of Cardiology or the Spanish Society of Cardiology, even in cases in which patient age, comorbidity or the personal criteria of the responsible cardiologist resulted in this option not being recommended to the patient or the refusal on the part of the patient. On the basis of the

se criteria, possible indications for EPS and/or device implantation were considered to be the following conditions: regular narrow QRS tachycardia,<sup>6</sup> atrial flutter,<sup>6</sup> an EF less than 30% due to ischemia, even in the absence of documented arrhythmias,<sup>7,8</sup> symptomatic ventricular arrhythmias in the presence of structural heart disease,<sup>9</sup> cardiogenic syncopal episodes in the presence of left ventricular systolic dysfunction of any etiology, even in the absence of documented arrhythmias,<sup>10</sup> and cardiogenic syncopal episodes in the presence of third-degree intraventricular block.<sup>10,11</sup>

A real indication of EPS and/or device implantation was recorded when the procedure had already been carried out or was indicated on the day of the visit.

Patients considered to be diabetic, hypertensive or dyslipidemic were those for whom drug treatment aimed at correcting these diseases had been recommended. A rheumatic valvular lesion of any degree of severity was recorded as valve disease. Valvular lesions of any other etiology were reported as valve disease only if the degree of severity was greater than mild. In order for the disease to be considered ischemic, we required a previous diagnosis of myocardial infarction, a

coronary angiographic study showing obstructive lesions or a clinical picture of typical angina pectoris considered as such by at least 2 cardiologists. Those patients who were active smokers at the time of the consultation, or had been within the preceding three months, were considered to be smokers, while ex-smokers were those who had given up smoking 10 years earlier. Antiarrhythmic medication did not include beta-blockers and implantable devices did not include pacemakers.

## RESULTS

In all, 798 patients (39%) presented one or more of the rhythm and conduction disturbances under consideration. The clinical characteristics of all the patients appear in Table 1. Table 2 shows the rhythm and/or conduction disturbances detected.

### Atrial Fibrillation

Atrial fibrillation was the arrhythmia most frequently encountered. It was present in one of every

TABLE 1. Clinical Characteristics of All the Patients (n=798)\*

Age, mean (SD), years (range)	68.7 (11.7) (14-92)
Men, n (%)	378 (47.4)
Absence of structural heart disease, n (%)	461 (57.7)
Valve disease, n (%)	180 (22.5)
Ischemic disease, n (%)	104 (13)
Systolic dysfunction (FE<40%) or HF with preserved systolic function, n (%)	85 (10.6)
Congenital, n (%)	7 (0.9)
Other structural heart diseases (chronic pericarditis, hypertrophic cardiomyopathy, etc), n (%)	9 (1.1)
Hypertension, n (%)	433 (54.2)
Diabetes, n (%)	167 (20.9)
Class I, n (%)	70 (8.7)
Dyslipidemia, n (%)	98 (24.9)
Smokers, n (%)	49 (6.1)
Ex-smokers, n (%)	119 (14.9)

\*EF indicates ejection fraction; HF, heart failure.

TABLE 2. Number and Percentages of Patients With Arrhythmias, Conduction Disturbances and Ejection Fraction Less Than 30% of Ischemic Origin, With or Without Documented Arrhythmias, Detected Among All the Patients Analyzed\*

	N	% (95% CI) of All the Diseases Detected (n=798)	% (95% CI) of All the Patients Analyzed (n=2045)
Atrial fibrillation	524	65.6 (62.3-68.9)	25.6 (23.7-27.5)
Atrial flutter	34	4.2 (2.8-5.6)	1.7 (1.1-2.3)
Regular narrow QRS tachycardia	58	7.2 (5.4-9)	2.8 (2.1-3.5)
Ventricular arrhythmias	19	2.4 (1.3-3.5)	0.9 (0.5-1.3)
EF<30% of ischemic origin	33	4.1 (2.7-5.5)	1.6 (1.1-2.1)
AV block or sick sinus syndrome	68	8.5 (6.6-10.4)	3.3 (2.5-4.1)
Intraventricular block	157	19.7 (16.9-22.5)	7.7 (6.5-8.9)
Others	4	0.5 (0-1)	0.2 (0-0.4)

\*AV indicates atrioventricular; CI, confidence interval; EF, ejection fraction.

four patients in our study population, constituting two thirds of the arrhythmias or conduction disturbances diagnosed. Of these patients, 45.4% were men and the mean age was  $69.8 \pm 10$  years; 300 of the 524 (57%) did not present structural heart disease; the arrhythmia accompanied a valve disease in 150 patients (29%, rheumatic in 112 cases), coronary artery disease in 46 (9%), dilated cardiomyopathy in 17 (3%), and other diseases (hypertrophic cardiomyopathy, chronic constrictive pericarditis, congenital heart disease and heart failure with preserved systolic function) in 11 (2%). After being seen, 75.2% of the patients (394 of 524) continued or began anticoagulant therapy.

The patterns of clinical presentation of arrhythmia, patient age, comorbidity and the use of anticoagulants according to each of the clinical patterns are shown in Table 3.

Electrical cardioversion had previously been performed or was considered to be indicated at the time of consultation in 43 patients (8.2%) and 78 (15%) were receiving antiarrhythmic therapy (flecainide in 38 cases, amiodarone in 36, propafenone in 3 and sotalol in 1). EPS had been carried out or was indicated in 17 patients, although this procedure was proposed for the treatment of accessory pathways, atrial flutter, AV node ablation, or concomitant ventricular arrhythmias; in only 1 case was it proposed for the treatment of AF.

#### Atrial Flutter

Common atrial flutter was detected in 34 patients, in two of whom it was permanent. The mean patient age was  $71.8 \pm 9$  years and 61.8% of those affected were men. Although 70.6% of the patients presented no structural heart disease, 62% (n=21) were hypertensive and 29% (n=10) were diabetic. Three patients had undergone electrical cardioversion. EPS had been performed in 7 (for ablation of a cavotricuspid isthmus in 5, for AV node ablation due to uncontrollable AF in 1 and for implantation of an automatic defibrillator and performance of biventricular stimulation due to severe systolic dysfunction of ischemic ori-

gin and heart failure in one). Cavotricuspid isthmus ablation was recommended for 6 patients on the day of their visit.

In 21 cases (61.7%), the flutter was associated with AF; 7 patients (21%) were receiving antiarrhythmic therapy, and 16 (47%), anticoagulant therapy.

#### Regular Narrow QRS Tachycardia

Fifty-eight patients were diagnosed as having regular tachycardia with narrow QRS complex that did not meet the criteria for common flutter; in 8 (14%), surface electrocardiogram revealed the presence of permanent or intermittent Wolff-Parkinson-White syndrome. The mean age was  $57 \pm 16.8$  years (range, 14 to 83 years) and 21 patients (36%) were men. In 83%, there was no evidence of structural heart disease; coronary artery disease was documented in 9%, valve disease in 3% and congenital heart disease in 2%. Nearly half of the patients (n=28) were hypertensive and 7% were diabetic. One patient had undergone electrical cardioversion, and EPS had been performed or was indicated in 29 (50%), in every case, for the purpose of carrying out radiofrequency ablation of the arrhythmogenic substrate. Nine patients (16%) were receiving antiarrhythmic therapy.

#### Ventricular Arrhythmias and/or Ejection Fraction Less Than 30% Due to Ischemia

Ventricular arrhythmias and/or an EF less than 30% due to ischemia was detected in 46 cases. Figure 1 shows the distribution of these patients.

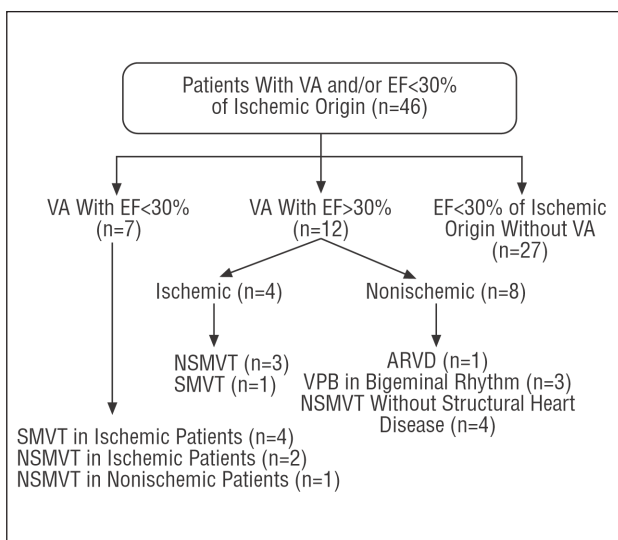
Four of the 27 patients with an EF less than 30% without documented arrhythmias had a QRS complex of more than 120 ms. The patients with ventricular premature beats were included because this disturbance was accompanied by nonsyncopal symptoms, was very often coupled with bigeminal rhythm and required treatment with beta-blockers.

Eleven patients (24%) had automatic defibrillators, 3 of them with biventricular stimulation; EPS was indicated in another 2 at the time of their

TABLE 3. Incidence of the Clinical Patterns of Atrial Fibrillation, According to Clinical Characteristics, Comorbidity, and Use of Anticoagulant Therapy\*

	Permanent	Paroxysmal	Persistent	First Episode
Incidence, %	60.4	14.5	13.3	11.6
Age, mean (SD), years	71.2 (8.9)	70 (11.4)	66.4 (10.3)	66.3 (11.4)
Absence of SHD, %	49.2	69.7	65.7	73.8
<65 years, %	20.1	26.3	37.1	42.6
<65 years, absence of SHD, HT and DM, %	1.2	9.2	8.5	19.6
Anticoagulants, %	87.7	48.7	71.4	47.5

\*DM indicates diabetes mellitus; HT, hypertension; SD, standard deviation; SHD, structural heart disease.



**Figure 1.** Distribution of the patients with ventricular arrhythmias and/or ejection fraction less than 30% of ischemic origin according to the disease detected.

ARVD indicates arrhythmogenic right ventricular dysplasia; EF, ejection fraction; NSMVT, nonsustained monomorphic ventricular tachycardia; SMVT, sustained monomorphic ventricular tachycardia; VA, ventricular arrhythmias; VPB, ventricular premature beats.

visit. One patient had undergone electrical cardioversion and 6 (13%) were receiving antiarrhythmic therapy.

The mean age of the patients with coronary artery disease was 72±9.1 years (range, 35 to 86 years) and 10 of them (27%) were over 75 years of age. In this group, 92% of the patients were men, 43% were hypertensive, 35% were diabetic, 8% were smokers, and 54% were ex-smokers.

**Intraventricular Conduction Disturbances**

Intraventricular block was, after AF, the most prevalent disturbance and was diagnosed in 157 patients. The incidence of each electrocardiographic pattern, the clinical characteristics and accompanying diseases

appear in Table 4.

Two patients had undergone an EPS, which was indicated in another 5 after their visit. Two patients were receiving biventricular stimulation, one of them with a defibrillating device.

**Changes in Sinus Node Function and Atrioventricular Conduction**

A total of 58 patients had permanent pacemakers, 2 presented asymptomatic second-degree AV block and 7, sinus node dysfunction unrelated to syncope. Among the patients with pacemakers, 28 (42%) presented AF, and 6 (10%) had an EF less than 40%.

The mean age in this group of patients was 70.2±11.3 years, 54% were men, 43% were hypertensive, 22% were diabetics, and 54% had no structural heart disease.

**Other Disturbances**

Two patients presented syncopal symptoms and an EF less than 30% of nonischemic origin, in the absence of documented ventricular arrhythmias or conduction disturbances; EPS was indicated in both cases. One patient had a cardiac event recorder inserted to control repeated syncopal episodes of unknown etiology, in the absence of structural heart disease and rhythm or conduction changes. Finally, 1 patient had an electrocardiographic recording compatible with Brugada syndrome in the absence of symptoms or family history of sudden death, and no additional examinations were requested.

**Incidence of Rhythm or Conduction Changes in Patients Being Seen for the First Time in a Cardiology Unit**

Of the 704 patients who had never been seen in a cardiology clinic, 153 (22%) presented 1 or more of the rhythm and conduction disturbances being analyzed. The mean age was 68.3±13 years and 52% of the

**TABLE 4. Electrocardiographic Patterns Detected in Patients With Intraventricular Conduction Disturbances, According to the Clinical Characteristics and the Accompanying Diseases\***

	LBBB (n=76)	RBBB (n=53)	RBBB+LAHB (n=28)	Overall (n=157)
Absence of structural heart disease, n (%)	35 (46)	36 (68)	15 (54)	86 (55)
Age, mean (SD), years	71.7 (9.7)	66.3 (14.5)	73 (8.9)	70.1 (11.9)
Men, n (%)	30 (39)	32 (60)	16 (57)	78 (50)
Hypertension, n (%)	48 (63)	31 (58)	17 (61)	96 (61)
Diabetes, n (%)	18 (24)	10 (19)	8 (29)	36 (23)
EF <40%, n (%)	21 (28)	1 (2)	3 (11)	25 (16)
Presence of syncope, n (%)	8 (10)	1 (2)	2 (7)	11 (7)
Atrial fibrillation, n (%)	13 (17)	7 (13)	7 (25)	27 (17)

\*EF indicates ejection fraction; LAHB, left anterior hemiblock; LBBB, left branch bundle block; RBBB, right branch bundle block; SD, standard deviation.

**TABLE 5. Numbers and Percentages of Arrhythmias and Conduction Disturbances Detected in Patients Seen for the First Time\***

	n	% (95% CI) of All the Diseases (n=153)	% (95% CI) of All the Patients (n=704)
Atrial fibrillation	81	52.9 (45-60.8)	11.5 (9.1-13.9)
Atrial flutter	6	3.9 (0.8-7)	0.8 (0.1-1.5)
Regular narrow QRS tachycardia	15	9.8 (4.5-13.7)	2.1 (0.9-2.9)
Ventricular arrhythmias	4	2.6 (0.1-5.1)	0.5 (0-1)
EF<30% of ischemic origin	1	0.6 (0-1.8)	0.1 (0-0.3)
AV block or sick sinus syndrome	2	1.3 (0.5-3.1)	0.2 (0.1-0.5)
Intraventricular block	45	29.4 (22.2-36.6)	6.3 (4.5-8.1)

\*AV indicates atrioventricular; EF, ejection fraction.

patients were men, 82% presented no structural heart disease, 13% had a valve disease, 2% had an ischemic disease, and 5 patients (3%) had an EF less than 40%. Their distribution according to the different diseases detected is shown in Table 5.

In 33 of the 81 patients with AF (41%), the attempt to achieve sinus rhythm was not considered to be indicated and it was decided to initiate treatment for permanent AF. Thirty-six patients (44%) were in sinus rhythm at the time they were examined and electrical cardioversion was indicated in the remaining 12.

Among the patients with ventricular arrhythmias, 3 presented ventricular premature beats and 1 had non-sustained monomorphic ventricular tachycardia; none of them presented structural heart disease.

An electrophysiological study was recommended in 7 cases (4.6%): 5 patients with regular narrow QRS tachycardia, 1 with atrial flutter and 1 with syncope left bundle branch block. Six patients (3.9%) began antiarrhythmic therapy (4 with flecainide and 2 with amiodarone).

#### *Patients in Whom Electrophysiological Study and/or Automatic Defibrillator or Biventricular Stimulation Were Indicated*

Table 6 shows the numbers of patients with a possible indication for EPS or device implantation, on the basis of the findings specified in the "Patients and Methods" section. In the "real indication" group, we included those patients in whom some procedure had been performed previously or was found to be indicated at the time of the visit. All the patients who were being seen for the first time were analyzed separately.

The number of patients with a possible indication for cardiac resynchronization in the group with systolic dysfunction of nonischemic origin and wide QRS complex is unknown since one of the essential requirements (the presence of persistent and incapacitating symptoms despite optimal treatment<sup>7</sup>) is difficult to establish objectively in a study of these characteristics. Of the 81 patients with systolic dysfunction (EF less than 40%) of any etiology, 25 (31%) presented advanced interventricular block, a finding that does not differ widely from that reported in a recent study.<sup>12</sup> Twenty patients met criteria for intra-

**TABLE 6. Numbers of Patients With Possible Indication for Electrophysiological Study and/or Defibrillator or Resynchronizer Implantation and Those in Whom These Measures Were Indicated, Specifying the Indications for the Patient Group as a Whole and Those Being Seen for the First Time\***

	Overall (n=2045)		Seen for First Time (n=704)	
	Possible Indication	Real Indication	Possible Indication	Real Indication
Narrow QRS tachycardia	58	29	15	5
Atrial flutter	34	11	6	1
Ventricular arrhythmias and/or EF<30% of ischemic origin	36	13	1	0
Syncope-related intraventricular block	11	7	3	1
Syncope in presence of nonischemic systemic dysfunction	2	2	0	0
Nonischemic systolic dysfunction with wide QRS complex	?	2	?	0
AV node ablation due to drug-refractory AF	?	1		
Substrate ablation in AF	?	1		
Total	143	66	25	7

\*AF indicates atrial fibrillation; AV, atrioventricular; EF, ejection fraction.

ventricular block and systolic dysfunction unrelated to ischemia.

The same reasons justify the interrogation of the group of patients with evidence of substrate involvement in AF and pacemaker implantation for drug-refractory AF.

## DISCUSSION

Rhythm and conduction disturbances are among the most common findings in a general cardiology clinic. They are detected in nearly 40% of the patients examined and in 1 of every 5 of those being seen for the first time. Seven percent of all patients and 3.5% of those being seen for the first time present clinical pictures that suggest the need to consider the performance of EPS and/or device implantation.

Atrial fibrillation was the arrhythmia most frequently found in our study, and is detected in one of every four patients examined, once again justifying its being referred to as the epidemic of the twenty-first century.<sup>13</sup> The high proportion of patients with rheumatic valve disease in our study, 1 in every 5 of those with AF, is another noteworthy finding. This situation is not reflected in other studies in which the percentage of patients with valvular disease ranges between 4% and 19%.<sup>1-14</sup> In the recent survey of the European Society of Cardiology (<https://www.euroheartsurvey.org/>), only 10% of the patients included presented heart valve disease. Although in our study, the presence of rheumatic disease was significant, the incidence of newly diagnosed cases was nearly anecdotal in that only two patients had been unaware of their being affected by the disease prior to the study. If migration does not alter this trend, we consider that, over the medium-term, rheumatic heart disease will cease to be so prevalent among our population, a circumstance that may affect the incidence of AF.

Permanent AF was the predominant clinical entity in our study, contrasting with the findings in the aforementioned European survey (<https://www.euroheartsurvey.org/>) and in patients hospitalized in our own center, where this clinical pattern was detected in only a third of the cases.<sup>15</sup> Thus, it is evident that the distribution of the patterns of clinical arrhythmias depends on the health care setting in which they are being analyzed, although in no case did permanent AF represent more than 50%. Anticoagulant therapy was widely employed among our patients and, although the results differ to some extent from those of other groups,<sup>16,17</sup> we consider that, in general, they are representative of the current trend in Spain and contrast with the situation of a decade ago.<sup>18,19</sup> Nevertheless, the use of anticoagulants still differs according to the clinical presentation of the arrhythmia, and they are less frequently administered to treat the

intermittent form, a circumstance that agrees with the general practice in Europe (<https://www.euroheartsurvey.org/>). This approach is justified, in part, by the younger age and lower risk of thromboembolism shown by our patients with intermittent arrhythmia, as has been reported previously.<sup>20</sup> However, we consider that the differences observed between the paroxysmal and the persistent patterns are not explained by this fact, and that the permanent or persistent presence of arrhythmia continues to be determinant for the prescription of drug treatment, despite the fact that the information currently available recommends that it be the thromboembolic risk factors, rather than the clinical presentation of the arrhythmia, that influences the form of treatment.<sup>20-22</sup>

The prevalence of atrial flutter is low in our study. The mean patient age was greater than that of the patients with AF, and AF had been documented in 2 of every 3 of the subjects in this group, thus confirming previous reports of the frequent association between these 2 arrhythmias.<sup>23-25</sup>

Although the number of patients with ventricular arrhythmias and/or left ventricular systolic dysfunction is not inconsiderable (1.6% of all the patients, according to the MADIT II criteria), it should be pointed out that, as could be expected, the outpatient cardiology clinic is not the gateway to the health care system for patients with this type of heart disease and, thus, newly diagnosed cases are exceptional at this level of care.

The difference between what we have referred to as a possible indication for EPS and the real indication or performance of the study should not, in our opinion, be attributed to ignorance of the clinical practice guidelines or to their improper application. These documents include, as class I recommendations, radiofrequency ablation in patients with brief and/or sporadic episodes and even certain isolated episodes of narrow QRS tachycardia.<sup>6</sup> Although the procedure can now be performed in our setting with a high probability of success and low rate of complications,<sup>26</sup> its purpose is not to prevent fatal or disabling complications, which are exceptional in this group of diseases, but to provide an effective treatment aimed at improving quality of life. Thus, in situations in which the patient considers that the disease does not keep him or her from performing normal daily activities, other therapeutic options may be valid. In our study, 50% of all the patients with this type of arrhythmia underwent an EPS; however, radiofrequency ablation was recommended in only 28% of those being seen for the first time.

A different approach should be employed to justify the fact that only 36% of the patients with ventricular arrhythmias and indication for EPS and/or an EF less than 30% of ischemic origin<sup>27</sup> and 63% of those presenting syncope in the presence of advanced intraven-

tricular block<sup>10,11</sup> were referred for EPS and/or defibrillator implantation. In the first case, the recent inclusion of this indication,<sup>7,8</sup> together with the advanced age of a significant proportion of the patients, may have influenced our decision. In the second case, the fact that our center does not have an electrophysiology laboratory is one reason why in patients with preserved EF and advanced age, we opted for permanent pacing without prior EPS.

Although it is evident that this report is not a population-based prevalence study and that it has all the limitations of studies focusing on a single center, we consider that it can provide information on the real demand generated by these diseases in our health care system given that our clinic is the only option for specialized outpatient cardiological care, within the public health system, available to the population in our area. If we extrapolate our data, a hospital that provides care for 10 000 patients a year in its outpatient clinics will have 3400 who have never been examined by a cardiologist; the possibility of performing an EPS and/or device implantation will have to be considered in 120 of the cases. These data are based on currently accepted indications and do not include indications that are presently a subject of debate, such as those related to biventricular stimulation,<sup>28,29</sup> or those that have yet to be fully established and developed in our setting (substrate ablation in AF), the introduction of which will require a radical change in the situation. Given that our study was based on the presence of documented arrhythmias, we have not included the indications for EPS in the absence of electrical or structural changes, despite the presence of highly specific clinical conditions (family history of sudden death, hereditary heart diseases, etc), in which the symptoms (palpitations, dizziness, etc) could influence this indication; we consider, however, that the importance of the latter situations, from a quantitative standpoint, is limited. Finally, we feel that our data may serve as a support for planning the allocation of human and material resources, as well as for establishing indicators for health care quality, designing continuing education activities or devising training programs for new specialists.

## REFERENCES

1. Go AS, Hylek EM, Phillips KA, Chang Y, Henault LE, Selby JV, et al. Prevalence of diagnosed atrial fibrillation in adults. National implications for rhythm management and stroke prevention. The anticoagulation and risk factors in atrial fibrillation (ATRIA) study. *JAMA*. 2001;285:2370-5.
2. Kannel WB, Wolf PA, Benjamin EJ, Levy D. Prevalence, incidence, prognosis, and predisposing conditions for atrial fibrilla-

- tion: population-based estimates. *Am J Cardiol*. 1998;82:N2-9.
3. Lloyd-Jones DM, Wang TJ, Leip EP, Larson MG, Levy D, Vasan RS, et al. Lifetime risk for development of atrial fibrillation: the Framingham Heart Study. *Circulation*. 2004;110:1042-6.
4. Furberg CD, Psaty BM, Manolio TA, Gardin JM, Smith VE, Rautaharju RM. Prevalence of atrial fibrillation in elderly subjects: the Cardiovascular Health Study. *Am J Cardiol*. 1994;74:238-41.
5. Fuster V, Rydén LE, Asinger RW, Cannom DS, Crijns HJ, Frye RL, et al. The ACC/AHA/ESC guidelines for the management of patients with atrial fibrillation. *Eur Heart J*. 2001;22:1852-923.
6. Blomstrom-Lundqvist C, Scheinman MM, Aliot EM, Alpert JS, Calkins H, Camm AJ, et al. ACC/AHA/ESC guidelines for the management of patients with supraventricular arrhythmias-executive summary. *J Am Coll Cardiol*. 2003;42:1493-531.
7. Gregoratos G, Abrams J, Epstein AE, Freedman RA, Hayes DL, Hlatky MA, et al. ACC/AHA/NASPE 2002 guidelines for implantation of cardiac pacemakers and antiarrhythmia devices: summary article. *Circulation*. 2002;106:2145-61.
8. Priori SG, Aliot E, Blomstrom-Lundqvist C, Bossaert L, Breithardt G, Brugada P, et al. Update of the guidelines on sudden cardiac death of the European Society of Cardiology. *Eur Heart J*. 2003;24:13-5.
9. Almendral J, Marín E, Medina O, Peinado R, Pérez-Álvarez L, Ruiz-Granel R, et al. Guía de práctica clínica de la Sociedad Española de Cardiología en arritmias cardíacas. *Rev Esp Cardiol*. 2001;54:307-67.
10. Brignole M, Alboni P, Benditt D, Bergfeldt L, Blanc JJ, Bloch Thomsen PE, et al. Guidelines on management (diagnosis and treatment) of syncope. *Eur Heart J*. 2001;22:1256-306.
11. Oter R, de Juan J, Roldán T, Bardají A, Molinero E. Guía de práctica clínica de la Sociedad Española de Cardiología en marcapasos. *Rev Esp Cardiol*. 2000;53:947-66.
12. Shen AY, Wang X, Doris J, Moore N. Proportion of patients in a congestive heart failure care management program meeting criteria for cardiac resynchronization therapy. *Am J Cardiol*. 2004;94:673-6.
13. Ezekowitz MD. Atrial fibrillation: the epidemic of the new millennium. *Ann Intern Med*. 1999;131:537-8.
14. Levy S, Maarek M, Coumel P, Guize L, Lekieffre J, Medvedowsky JL, et al. Characterization of different subsets of atrial fibrillation in general practice in France: the ALFA study. The College of French Cardiologists. *Circulation*. 1999;99:3028-35.
15. Vázquez E, Márquez A, Fajardo A, Lozano C, Guzmán M, Ramírez A, et al. Patrones clínicos de presentación de la fibrilación auricular en los pacientes hospitalizados. *Rev Esp Cardiol*. 2003;56:1187-94.
16. Blanch P, Freixa R, Ibernón M, Delso J, Salas E, Sobrepera JL, et al. Utilización de anticoagulantes orales en pacientes con fibrilación auricular al alta hospitalaria en el año 2000. *Rev Esp Cardiol*. 2003;56:1057-63.
17. Ruiz-Ortiz M, Romo E, Franco M, Mesa D, Anguita M, López-Granados A, et al. Un protocolo prospectivo permite incrementar la utilización de anticoagulación oral en pacientes con fibrilación auricular crónica no valvular. *Rev Esp Cardiol*. 2003;56:971-7.
18. Vázquez E, Martín Rubio A, Pousibet H, Lozano C, Guzmán M, Tarabini A, et al. Utilización del tratamiento anticoagulante en los pacientes con fibrilación auricular no reumática. *Rev Esp Cardiol*. 2000;53:200-4.
19. Vázquez E, Martín Barranco MJ, Martín Rubio A, Fajardo A, Lozano C, Guzmán M, et al. Cambios en el perfil clínico de los pacientes anticoagulados durante la década de los noventa. *Rev Esp Cardiol*. 2002;55:55-60.
20. Hart RG, Pearce LA, Rothbart RM, McAnulty JH, Asinger RW, Halperin JL. Stroke with intermittent atrial fibrillation: incidence and predictors during aspirin therapy. *Stroke Prevention in Atrial Fibrillation Investigators*. *J Am Coll Cardiol*. 2000;35:183-7.
21. van Walraven C, Hart RG, Wells GA, Petersen P, Koudstall PJ, Gullow A, et al. A clinical prediction rule to identify patients



- with atrial fibrillation and a low risk for stroke while taking aspirin. *Arch Intern Med.* 2003;163:936-43.
22. Aboaf AP, Wolf PS. Paroxysmal atrial fibrillation. A common but neglected entity. *Arch Intern Med.* 1996;156:362-7.
  23. Halligan SC, Gersh BJ, Brown RD, Rosales G, Munger TM, Shen WK, et al. The natural history of lone atrial flutter. *Ann Intern Med.* 2004;140:265-8.
  24. Biblo LA, Yuan Z, Quan KJ, Mackall JA, Rimm AA. Risk stroke in patients with atrial flutter. *Am J Cardiol.* 2001;87:346-9.
  25. da Costa A, Romeyer C, Mourot S, Messier M, Cerisier A, Faure E, et al. Factors associated with early atrial fibrillation after ablation of common atrial flutter. *Eur Heart J.* 2002;23:498-6.
  26. Álvarez-López M, Rodríguez-Font E. Registro español de ablación con catéter. II informe oficial de la sección de electrofisiología y arritmias de la Sociedad Española de Cardiología. *Rev Esp Cardiol.* 2003;56:1093-104.
  27. Moss AJ, Zareba W, Hall WJ, Klein H, Wilber DJ, Cannom DS, et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. *N Engl J Med.* 2002;346:877-83.
  28. Bristow MR, Saxon LA, Boehmer J, Krueger S, Kass DA, de Marco T, et al. Cardiac-resynchronization therapy with or without an implantable defibrillator in advanced chronic heart failure. *N Engl J Med.* 2004;350:2140-50.
  29. Hernández-Madrid A, Escobar C, Blanco B, Marín I, Moya JL, Moro C. Resincronización cardíaca en la insuficiencia cardíaca: bases, métodos, indicaciones y resultados. *Rev Esp Cardiol.* 2004; 57:680-93.