

Temporary Pacemakers: Current Use and Complications

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Introduction and objective. Temporary pacemakers (TP) are used in the emergency treatment of patients with severe bradyarrhythmia. They are often used in emergency situations and for older patients in poor general condition who are hemodynamically unstable and uncooperative. The aim of this study was to review and analyze the indications, incidence, and type of complications associated with TP implanted in our center during a 6-year period.

Patients and method. We analyzed significant clinical variables, indication, route of insertion, follow-up, complications, and duration of temporary pacing.

Results. A total of 568 TP were implanted, and 530 cases were available for review (mean age 74.8 [11] years). The main indications were symptomatic complete AV block (51%), prophylaxis for replacement with a definitive pacemaker (14.7%), blockage in the acute phase of myocardial infarction (12.6%), bradyarrhythmia due to drug intoxication (12.2%), symptomatic sick sinus syndrome (7.5%), and long QT interval or ventricular tachycardia (2.5%). The route of insertion was via the femoral vein in 99% of the cases. The duration of TP use was 4.2 days (range, 1 to 31 days). A total of 369 patients (69.6%) required a permanent pacemaker. Complications: 34 patients died (6.4%), but only 3 deaths were attributable to TP implantation. Other severe complications were seen in 98 patients (18.5%). Malfunction of the TP occurred in 48 patients (9%) because of electrode displacement.

Conclusions. Temporary pacemakers are used in older patients with extreme bradyarrhythmia and occasionally with acute myocardial infarction. Serious complications are not uncommon (22% of all patients), and can range from femoral hematoma to cardiac tamponade and even death (6%). In 9% of the patients the electrode needed to be repositioned because of failure of sensing or loss of ventricular capture.

Key words: *Temporary pacemakers. Complications. Indications.*

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Marcapasos temporales: utilización actual y complicaciones

Introducción y objetivo. Los marcapasos temporales (MT) permiten el tratamiento urgente de pacientes con bradiarritmias severas. Se los utiliza en las situaciones urgentes y con frecuencia en ancianos con estado general deteriorado, inestabilidad hemodinámica y escasa colaboración. El objetivo es revisar los MT implantados en nuestro centro en los últimos 6 años y analizar sus indicaciones, incidencia y tipo de complicaciones.

Pacientes y método. Se han analizado las variables clínicas significativas, la indicación, la vía de acceso, el seguimiento, las complicaciones y los días de mantenimiento del MT.

Resultados. Se implantó un total de 568 MT y se pudo revisar 530 casos (edad, 74,8 ± 11 años). Las indicaciones para su implantación fueron: bloqueo auriculoventricular sintomático (51%) y profiláctico por recambio de generador (14,7%), bloqueo en la fase aguda del infarto (12,6%), bradiarritmia por intoxicación medicamentosa (12,2%), enfermedad del nodo sinusal (7,5%) e intervalo QT largo o taquicardia ventricular (2,5%). Se colocaron por la vena femoral en el 99% de los casos. La duración del MT fue de 4,2 días (rango, 1-31 días). Requirieron un marcapasos definitivo 369 pacientes (69,6%). En cuanto a las complicaciones, se produjo el fallecimiento de 34 pacientes (6,4%), aunque sólo en 3 fue atribuible al MT. En 98 pacientes (18,5%) se observaron otras complicaciones severas, entre ellas, disfunción del MT en 48 pacientes (9%) por movilización del electrocatéter.

Conclusiones. Los MT se emplean con frecuencia en ancianos con bradiarritmia extrema y, en ocasiones, infarto agudo de miocardio. Las complicaciones graves son frecuentes (22%) y se puede producir desde un hematoma femoral hasta un taponamiento cardíaco o incluso la muerte (6%). En un 9% de los casos, el electrodo debe ser recolocado por fallo del sensor o de la captura ventricular.

Palabras clave: *Marcapasos temporales. Complicaciones. Indicaciones.*

ABBREVIATIONS

AMI: acute myocardial infarction.
 AVB: atrioventricular block.

INTRODUCTION

Temporary transvenous endocardial pacing was first described by Furman and Robinson in 1958.¹ Although there are several types of temporary cardiac pacing (transcutaneous, transesophageal), the most widely used is transvenous, i.e., peripheral venous puncture and placement of an electrode in the right chambers. This type of pacing has been employed since the 1960s, when it was first used in patients with permanent arrhythmias. Since that time, it has become common in the majority of hospitals, and the indications for its use are currently well established by the American College of Cardiology/American Heart Association (ACC/AHA).²

According to these published standards,² temporary artificial pacing is indicated in various situations, particularly in patients with severe bradyarrhythmia (second- or third-degree atrioventricular block [AVB], or severe symptomatic bradycardia). It can also be used in overdrive atrial pacing to suppress tachyarrhythmias such as atrial flutter, or in overdrive ventricular pacing to treat recurrent ventricular tachycardia or to prevent severe ventricular arrhythmia secondary to prolonged QT interval. In addition, temporary pacing can be used as a bridge when replacing the generator in patients with a permanent pacemaker.

The use of temporary pacing in acute myocardial infarction (AMI) deserves special attention, since the risk-benefit ratio is not well defined in these cases. Although the presence of AVB is thought to imply greater mortality in these patients, death is usually related to the infarct size rather than the conduction disorder.³

Temporary pacing is used in situations of extreme emergency, and the devices are frequently implanted in older uncooperative patients. Implantation is typically accompanied by hemodynamic and/or electric instability that sometimes does not allow perfect placement, thus resulting in greater morbidity and mortality. Furthermore, implantation often must be done by medical residents during on-duty hours when supervision by the cardiology staff may be limited. Due to the progressive ageing of the population, the incidence of AVB is higher, and this fact may explain the higher number of permanent pacemakers and, by extension, temporary pacemakers, that are required.⁴

The recent literature contains no data on the incidence of complications in this procedure. Therefore, we felt it would be useful to analyze the outcome of temporary pacemaker placement and in-hospital follow-up of patients who need this device, and assess the complications potentially resulting from its use.

The study objectives were to determine the clinical characteristics of patients who required placement of a temporary pacemaker at our hospital, to assess the arrhythmia etiology and clinical follow-up of patients treated during hospitalization, and lastly to compile data on the related incidence and types of complications.

PATIENTS AND METHODS**Patients**

A total of 568 patients received a temporary pacemaker over a 6-year period from 7 July 1997 to 31 May 2003; the medical histories for 530 (93%) of them were available for review. The remaining 38 patients correspond to cases transferred to another hospital after placement of the temporary pacemaker and for whom no follow-up was available. The most significant clinical variables (age, sex, concomitant diseases, and drug history) were analyzed, and the data for implantation of provisional pacemakers were also assessed, in particular, clinical symptoms and indication for implantation, route of access, thresholds, radioscopy time, etc. Data on patient progress during hospitalization were also analyzed, specifically, the treatment administered, need for a permanent pacemaker, clinical progress, complications, and in-hospital mortality.

Pacemaker Placement

All temporary pacemaker electrodes were implanted by the coronary care unit of our hospital in the examination room and with the help of a portable image intensifier. In all cases, a previously established protocol was used. The electrode catheters were placed by a cardiologist or by a cardiology resident under the supervision of a cardiologist. Bipolar electrode catheters (caliber, 6 Fr) were inserted in the femoral vein using the Seldinger technique and placed in the right ventricular apex under radioscopy; a pacing threshold of 0.5-0.7 V was considered adequate. Temporary pacing was initially set at voltage values twice the threshold level. In all cases, electrode positioning was confirmed by chest x-ray. The patient remained on bed rest under continuous electrocardiographic monitoring (telemetry) until the permanent pacemaker was implanted or the symptoms causing the indication for a temporary pacemaker had been resolved. All patients received therapeutic doses of anti-coagulant therapy until the temporary pacemaker was

removed. In most cases, anticoagulation was performed with subcutaneous low-molecular-weight heparin at anticoagulant doses (mg/kg weight/12 h). Intravenous heparin sodium was used in some cases (impaired kidney function, mechanical heart valves, postinfarction, etc), with activated partial thromboplastin time (APTT) monitoring and dose adjustments to maintain this value between 1.5 and 2.5.

Pacemaker malfunction was defined as failure of capture or sense, or both. Only complications directly attributed to the temporary pacemaker were reported. The specific mortality was determined for each cause.

In addition, the incidence of complications was analyzed according to whether the placement was done by a cardiologist or a cardiology resident.

Statistical Analysis

Results are expressed as mean \pm standard deviation (SD) in the case of quantitative variables, and as percentages with 95% confidence interval (CI) using the exact binomial method in the case of qualitative variables. The statistical analysis used Student's *t* test for independent samples in the case of quantitative variables and the chi-square test for qualitative variables. In the between-group analysis of pacemaker malfunction and death, the statistically significant variables were introduced in multivariate analyses using forward stepwise logistic regression (0.5 for entry, 0.10 for removal) to assess the independence of variables. SPSS for Windows, version 11.0 (SPSS Inc. Chicago, United States) was used for the statistical analysis. Significance was set at a *P*-value $<.05$.

RESULTS

Mean age of the patients assessed (530) was 74.8 ± 11 years (range, 15-98); 285 were men and 245, women. The clinical variables are listed in Table 1. A total of 67 patients (13%) presented AMI complicated by some advanced type of conduction disorder such as AVB, acute bifascicular block or asystole. This group presented special characteristics, with a lower age and different prevalence of risk factors than the group without AMI. Demographic and comorbidity data are shown in Table 2.

The indications for a temporary pacemaker included symptomatic advanced AVB in 270 cases (51%), prophylactic use due to generator replacement in 78 patients (14.7%) with a permanent pacemaker, bundle-branch block in the acute phase of AMI in 67 patients (13%), bradyarrhythmia due to drug intoxication in 65 patients (12.2%), symptomatic sinus node disease in 39 patients (7.4%), and long QT interval or ventricular tachycardia in 13 patients (2.5%) (Figure 1).

The clinical manifestations leading to implantation were syncope in 214 patients (40.4%) and light-head-

TABLE 1. Description of the Clinical Variables of the Population*

	Complete Group
Age, years	74.8 \pm 11
Male sex	54%
HT	54%
Diabetes	32%
Dyslipidemia	24%
History of IHD	23%
COPD	19%
Current AMI	13%
History of stroke	13%
Valvular heart disease	7%
Dementia	7%
Dilated cardiomyopathy	4%
Obesity	5%

*AMI indicates acute myocardial infarction; COPD, chronic obstructive pulmonary disease; HT, hypertension; IHD, ischemic heart disease.

Diagnostic criteria for high blood pressure, diabetes, dyslipidemia, and COPD: if treatment was required. Criteria for obesity: body mass index >25 . Criteria for dementia: clinical symptoms of previous disorientation or loss of cognitive capacities.

TABLE 2. Comparison of the Clinical Characteristics of the Groups With and Without Acute Myocardial Infarction*

	AMI Group (n=67)	Non-AMI Group (n=463)	<i>P</i>
Age, years	70 \pm 10	76 \pm 11	$<.001$
History of IHD	58%	17%	$<.001$
Dementia	1.5%	8%	.01
Diabetes	48%	30%	.01
Male sex	67%	52%	.02
Dyslipidemia	34%	22%	.05
History of stroke	16%	13%	.44
COPD	22%	19%	.51
HT	54%	55%	.89

*AMI indicates acute myocardial infarction; COPD, chronic obstructive pulmonary disease; HT, hypertension; IHD, ischemic heart disease.

edness in 112 (21.1%); 126 patients (23.8%) exhibited the clinical symptoms of left-sided heart failure, and 63 (11.9%), right-sided heart failure. In 15 patients (3%), the initial symptoms could not be determined from the clinical history. Cardiac arrest requiring cardiopulmonary resuscitation occurred in 42 patients (7.9%).

The mean ventricular rate at the time of pacemaker placement was 35 ± 8 bpm.

Implantation was through the femoral vein in 99% of the cases, with the right femoral used most often (96%). The subclavian and jugular veins were used in two cases each.

Evolution

After placing the pacemaker, 97% of the patients were given low-molecular-weight heparin sodium at

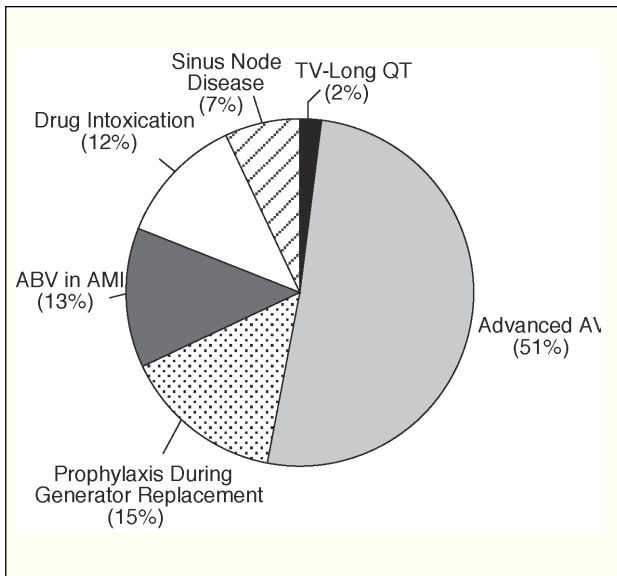


Fig. 1. Indications for placement of temporary pacemaker. AMI indicates acute myocardial infarction; AVB, atrioventricular block; VT, ventricular tachycardia.

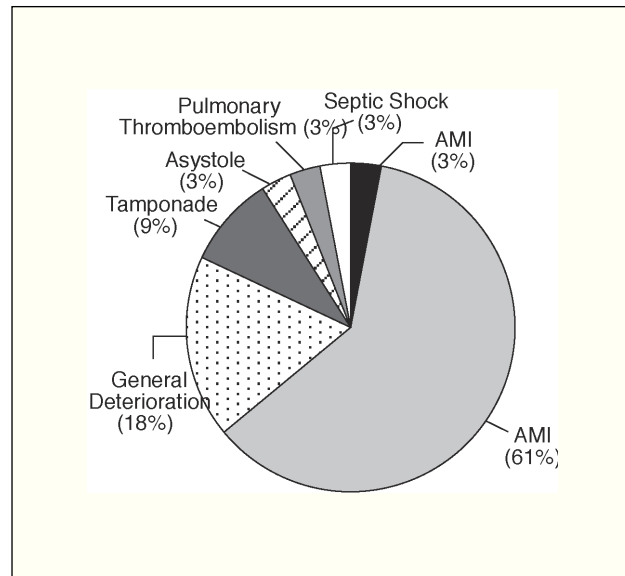


Fig. 2. Causes of mortality (n=34). AMI indicates acute myocardial infarction.

therapeutic doses. Anticoagulation was not used in 3%, mainly because of early implantation of a permanent pacemaker. The duration of temporary pacing was 4.2 days (range, 1-31). A total of 369 patients (69.6%) required a permanent pacemaker during hospitalization.

Complications

There were a total of 148 complications in 116 patients (22%) (Table 3).

Mortality

Thirty-four deaths (6%) occurred after implantation of a temporary pacemaker (Figure 2); 21 of these patients died of complications resulting from AMI. The group with AMI and a temporary pacemaker included

TABLE 3. Incidence of Complications

Complications (n=530)	Number	Percentage (95% CI)
Death	34	6.4 (4.5-8.9)
Malfunction	48	9.1 (6.8-11.8)
Femoral hematoma	15	2.8 (1.6-4.6)
Arrhythmias	15	2.8 (1.6-4.6)
Fever	10	1.9 (0.9-3.4)
Tamponade	9	1.7 (0.8-3.2)
Pericardiocentesis	6	1.1 (0.4-2.5)
Deep venous thrombosis	4	0.8 (0.2-1.9)
Sepsis	3	0.6 (0.1-1.7)
Femoral artery perforation	2	0.4 (0.1-1.4)
Pericarditis	2	0.4 (0.1-1.4)

67 patients; thus, in-hospital mortality in this group was 31%.

Seven patients died of causes unrelated to cardiac disease: 6 from general deterioration and 1 from massive stroke.

Another 6 patients (1%) died of complications attributable to the temporary pacemaker. Three deaths were due to tamponade caused by perforation of the right ventricle with the electrode catheter (Figure 3). In 1 case, death occurred due to asystole during insertion of the pacemaker. Another patient died from a massive pulmonary thromboembolism secondary to thrombosis of the femoral vein used for electrode placement. Finally, there was 1 death due to septic shock, also attributable to the pacemaker.

The study population was divided into 2 groups according to mortality, and the most significant clinical variables were compared (Table 4). Acute myocardial infarction (AMI) or tamponade during evolution were statistically significant variables. In the logistic regression analysis, performed by introducing the most relevant predictors of mortality continued to be AMI (odds ratio [OR]=21.4; 95% CI, 9.3-48.9; *P*<.001) or cardiac tamponade during the course of the condition (OR=15.6; 95% CI, 3.1-78.4; *P*<.05).

Pacemaker Malfunction

In 48 patients (9%), pacemaker function was compromised due to migration of the electrode catheter, which required reimplantation. Between-group comparison showed a higher incidence of patient disorientation in the group with malfunction (19%) than



Fig. 3. Echocardiographic image from subcostal view. Severe pericardial effusion with image of the visible electrode tip in the pericardial cavity (arrow), after perforation of the right ventricle. PE indicates pericardial effusion; RV, right ventricle; LV, left ventricle.

in the group without malfunction (1.9%) ($P<.001$) Table 5). Logistic regression analysis of clinical variables potentially influencing the existence of malfunction showed that disorientation was the

TABLE 4. Mortality Data*

	No Death (n=496)	Death (n=34)	P
Age, years	74.8±10.7	73.9±11.6	.59
Male sex	54%	47%	.42
Diabetes	32%	32%	.99
HT	54%	56%	.87
Dyslipidemia	24%	24%	.99
History of IHD	21%	38%	.06
COPD	19%	21%	.86
Dementia	7.1%	8.8%	.70
History of stroke	13%	26%	.08
AMI	9.3%	62%	<.001
Threshold	0.5±0.3	0.5±0.2	.85
Radioscopy time	6.5±6.6	7.5±7.8	.42
Pacing, days	4.2±3.2	4.3±5.1	.88
Disorientation	3.2%	5.9%	.41
Malfunction	8.9%	12%	.57
Hematoma	2.8%	2.9%	.97
Tamponade	1.2%	8.8%	<.001
Fever	1.8%	2.9%	.64

Variables Significantly Associated With Mortality in the Logistic Regression Model

	OR	95% CI	P
AMI	21.4	9.3-48.9	<.001
Tamponade	15.6	3.1-78.4	<.001

*OR indicates odds ratio; CI, confidence interval; AMI, acute myocardial infarction; COPD, chronic obstructive pulmonary disease; HT, hypertension; IHD, ischemic heart disease.

TABLE 5. Malfunction Data*

	No Malfunction (n=482)	Malfunction (n=48)	P
Age, years	74.8±10.7	73.9±11.6	.59
Male sex	54%	48%	.39
Diabetes	32%	38%	.42
HT	53%	67%	.70
Dyslipidemia	22%	35%	.08
History of IHD	22%	23%	.94
COPD	20%	15%	.37
Dementia	7.5%	4.2%	.40
History of stroke	12%	23%	.10
AMI	13%	10%	.63
Threshold	0.5±0.3	0.6±0.2	.17
Radioscopy time	6.6±6.7	6.1±5.9	.57
Pacing, days	4.2±3.4	4.4±2.6	.64
Permanent pacemaker	70%	67%	.64
Disorientation	1.9%	19%	.005
Hematoma	2.9%	2.1%	.74
Tamponade	0.6%	12.5%	.02
Fever	1.5%	6.3%	.13
Death	6.2%	8.3%	.57

Factors Independently Associated With Malfunction

	OR	95% CI	P
Disorientation	10.7	3.8-29.9	<.001
Tamponade	19.1	4.3-84.9	<.001

*OR indicates odds ratio; CI, confidence interval; AMI, acute myocardial infarction; COPD, chronic obstructive pulmonary disease; HT, hypertension; IHD, ischemic heart disease.

strongest independent predictive variable, with a 10.7-fold higher risk of malfunction (95% CI, 3.8-29.9; $P<.001$) in patients presenting with disorientation than those without. Tamponade was found to be more a consequence of the procedure than a predictive variable. Other variables likely to be predictive of malfunction, such as duration of pacing, threshold and radioscopy time were not statistically significant.

Other Complications

In 50 patients (9%), there were 57 severe complications: in 15 cases, the patient developed a considerable femoral hematoma (4 required transfusion) although anticoagulant overdose was not detected; 15 presented ventricular tachycardia or ventricular fibrillation during placement; 10 patients presented with fever $>38^{\circ}\text{C}$ (3 had sepsis with positive blood culture), which the clinician attributed to the pacemaker; 9 experienced acute cardiac tamponade, with 6 of these undergoing urgent pericardiocentesis; in addition, there were 4 cases of deep venous thrombosis, 2 pericarditis with moderate effusion and 2 perforations of the femoral artery.

TABLE 6. Evolution and Complications in Groups With and Without Acute Myocardial Infarction

	AMI (n=67)	No AMI (n=463)	P
Death	31%	2.8%	<.001
Permanent pacemaker	10%	78%	<.001
Pacing, days	6.1±5	3.9±3	<.01
Complications	48%	18%	<.001
Hematoma	6.0%	2.4%	.24
Malfunction	7.5%	9.3%	.63
Tamponade	1.5%	1.7%	.89
Fever	1.5%	1.9%	.80

*AMI indicates acute myocardial infarction.

Comparison of Groups With and Without Acute Myocardial Infarction

The clinical variables for patients with and without AMI were compared (Table 2), as were patient evolution and complications (Table 6), showing differences in the duration of temporary pacing (6.1±5 vs 3.9±3 days; $P<.01$), need for a permanent pacemaker (9% vs 78%; $P<.001$), mortality (31% vs 2.8%, $P<.001$), and total number of complications (48% vs 18%; $P<.05$).

Comparison of Implantation by Cardiologists or Medical Residents

Of the 530 procedures, 98 were carried out exclusively by cardiologists. The remaining 432 were implanted by cardiology residents under the supervision of a cardiologist. The main demographic characteristics of the 2 groups are shown in Table 7. There were no differences in the overall percentage of complications between the 2 groups.

DISCUSSION

Types of Patients

The mean age of patients with temporary pacemakers was very high (35% were over 80 years old), and many had a number of important cardiovascular risk factors and concomitant diseases. Hence, the population has an inherently high risk of complications. A high percentage also presented severe symptoms and a low mean ventricular rate before pacemaker placement.

Indications

The indications in our series are very similar to those reported by other authors. Half the indications mentioned in the 1996 article by Murphy⁵ were due to complete AVB, and a lower percentage due to complications of AMI. In 1997 Ochoa et al⁶ found that the in-

TABLE 7. Comparison Between Type of Physician Who Performed the Implantation and the Clinical Progress and Complications*

	Cardiologist (n=98)	Resident (n=432)	P
Age, years	72.7±12	75.3±10	.035
AMI	20%	11%	.026
Pacing, days	4.7±4	4.1±3	.11
Permanent pacemaker	61%	72%	.059
Total complications	28%	21%	.162
Hematoma	5.1%	2.4%	.238
Malfunction	10%	9.0%	.662
Tamponade	0%	2.1%	.150
Fever	0%	2.3%	.129
Venous thrombosis	1%	0.7%	.737
Death	10.2%	5.6%	0.157

*AMI indicates acute myocardial infarction.

dications in more than half the population studied were AVB and sinus node disease, and rhythm disturbances secondary to AMI were the second most frequent cause. Conversely, older series, such as the one published by Jowet et al in 1989,⁷ report that up to 84% of patients requiring a temporary pacemaker presented AMI. This change in the proportion of indications is probably due to advances in the treatment of patients with AMI. The use of fibrinolytics and the rapid care given to these patients have led to spectacular improvements in the incidence of complications and survival.⁸

Implantation Data

The femoral approach, which allows rapid access and easy compression in case of bleeding, is preferred in our unit and was predominant in our series. The other approaches, used in very few cases, were alternative options when the femoral vein was not accessible. Other series^{5,9} present a greater predominance of the subclavian and jugular approaches, which were seldom used at our hospital.

The mean duration of temporary pacing was 4.2 days, a number justified by patients required prolonged pacing, for example, those presenting AMI or receiving treatment for bradyarrhythmia secondary to drug intoxication, who account for 25% of our series (Figure 1).

Complications

Temporary pacing has been associated with multiple complications since it was first used. However, there are considerable differences in the reported morbidity and mortality. A study conducted in 1983 by Hynes et al⁹ with 1022 patients, the largest series published to date, reported no deaths and only 13.7% with complications,

of which pericardial rub was most frequent (5.3%).⁹ In contrast, in 1996 Murphy⁵ reported complications in 68 patients (35%) and death of 55 (28%) in a series of 194 patients. The author attributed this high percentage of complications to limited training of the young doctors and minimal supervision by more experienced physicians, as well as the use of central venous approaches that allow little compression. In 1999 Petch¹⁰ also cited physicians' limited experience as the reason for a high number of complications. In a series of 81 patients in Spain, Ochoa et al⁶ reported complications in less than 20% and no cases of perforation or death.

In our series, 22% of the patients presented complications of some kind. This high incidence of complications may be attributed to the fact that these pacemakers were inserted in emergency cases and in patients with AMI or poor clinical condition. Another possible explanation would be that a large number of pacemakers were implanted by medical residents under the supervision of more experienced cardiologists (82% of our population). The groups in whom implantation was done by cardiologists or residents (Table 7) were not randomly distributed. Therefore the patients' baseline severity and prognostic factors could be controlled, despite the inherent methodological problems, the analysis shows that in our setting and with our clinical protocol there were no differences in the complications observed between the groups. In contrast, there was a non significant tendency for patients in whom placement was done by experienced cardiologists to present more complications, possibly because these physicians take on the cases with a greater initial risk, e.g., patients with AMI (Table 7). Temporary pacemaker implantation by medical residents in our setting was not associated with a higher number of complications.

Mortality was 6% in our series, and was much higher in the group with AMI (30%) than the group without AMI (2.8%). The causes of mortality in the AMI patients were complications of the infarction in all cases. Only 6 patients died of causes possibly related to the procedure (3 tamponades due to right ventricle perforation, 1 asystole, 1 massive pulmonary thromboembolism, and 1 sepsis), accounting for 1% of all patients. Mortality in the AMI group appears to be lower than that reported in earlier series, which had levels of around 50%.^{3,7} This decrease in mortality is probably a partial reflection of the increased survival of patients with AMI in recent years.⁸

On logistic regression analysis, only the presence of AMI and cardiac tamponade were independent risk factors for mortality in our series.

Perforation

Perforation occurred at a level very similar to that reported in other articles, which have shown that per-

foration of the right ventricle can cause death; however, in many cases this is not dangerous and only causes failure to capture.^{11,12}

Infection

The percentage of infection at the puncture site and sepsis was extremely low in our review. This may be because asepsis was maintained despite the urgency with which temporary pacemakers were implanted in our patients. In other series, the percentage of infection was very similar, being around 1%.^{5,13,14}

Thromboembolism

In our series, clinically recognized pulmonary embolism occurred in only 1 patient, who died. Another 3 patients presented clinical symptoms of deep venous thrombosis. In previous series, the presence of deep venous thrombosis ranges between 25% and 39%.^{5,10,15} The low prevalence in our patients could be due to 2 factors: *a*) the use of therapeutic doses of heparin as part of the pacemaker implantation protocol, not routinely used in previous series, and *b*) diagnosis established by ultrasound techniques and phlebography in the series described, with most patients presenting no symptoms.

Malfunction

Malfunction due to electrode migration was 9% in our series, much lower than the reported levels of 18%-43% in previous series.^{5,6} This problem could be due to incorrect electrode positioning in the endocardium caused by the urgency of the procedure or by the duration of pacing. After logistic regression analysis, the only factor independently related to malfunction was patient disorientation, which indicated a 10.7-fold higher risk of this occurring. Disorientation, which is extremely common among older patients, would lead to mobilization of the limb and the electrode catheter, causing malfunction. In our series, however, the duration of pacing was not an independent variable for malfunction, probably because it was shorter than that of other series.^{5,7}

Limitations of the Study

This retrospective, descriptive study has the limitations inherent to this type of design. Despite the high number of patients reviewed, the data obtained from this single hospital may not be applicable to all patients with temporary pacing. Nevertheless, the findings provide an accurate picture of actual clinical practice with this procedure in our setting. This previously unavailable information could serve as a basis for a prospective, multicenter registry of temporary pacemaker use.

Conclusions

Temporary pacemakers are necessary, as they decrease mortality in patients with severe bradyarrhythmia. Such devices are frequently used in elderly patients, many with multiple conditions, and occasionally with bradyarrhythmia secondary to acute myocardial infarction (13%). The most frequent arrhythmia is complete AVB. There are important clinical differences between patients who present complete AVB either spontaneously or drug-induced and those in whom it is secondary to AMI. In our population and at the short-term, most patients are treated by placement of a permanent pacemaker (69.6%). The incidence of complications affected 22% of our patients, although many were not serious. Less frequent, but serious complications, included cardiac tamponade (1.7%) and death (6%). The mortality was much higher among patients with AMI, up to 30%. Procedure-related mortality was 1%. In 9%, the electrode had to be reimplanted due to malfunction.

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