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### RESEARCH ARTICLE

#### CARDIAC STIMULATION AT MILITARY HOSPITAL MOHAMMED V : REPORT OF 100 PROCEDURES OF A MONOCENTRIC EXPERIENCE

Hlal O.A, Gziri A. and Berrada N

#### Manuscript Info

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#### Abstract

The final pacing knows every year new progress. Despite the technological advances and individual optimization of pacing mode, this therapy is still subject to a rate of complications steady for several years. Monitoring paced patients also suffers from several shortcomings in one hand, the arrangements for monitoring and also the management of complications inherent in this therapy. In this context, we are interested in studying the final pacing through the experience of our service to analyze the epidemiological characteristics of stimulated population, implantation technique, complications and follow-up data. Our study is descriptive and was conducted at the cardiology department of the military hospital in Meknes. It covers 100 consecutive patients with a pacemaker in the cardiology department of the flap military hospital between January 2015 and March 2016. The mean age of patients was 59,55 years. The functional symptoms before implantation were dominated by faintness and syncope respectively, 44% and 34%. Atrioventricular blocks represented the main indication for implantation (66%) followed by sinus dysfunction (16%). The complications (hematoma, pneumothorax, infection of the lodge of the pacemaker, lead dislodgement, pacemaker syndrome) were found in 18% of our series. Although complications related to the definitive pacemaker are not frequent, the organization of the stimulated patient monitoring is essential in order to watch the occurrence of potentially serious complications

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#### Introduction:-

In 1962, when the first pacemaker was implanted, the only indication was limited to prevention of sudden death from prolonged cardiac arrest. Since then, the benefits of cardiac stimulation are such that they have allowed a considerable development of this therapy, both technically and in terms of indications.

Single or double chamber pacemaker is an electrical pulse generator that stimulates the myocardium to restore a normal rhythm during a slowing of the heart rate (bradycardia) or a conduction defect (BAV). They are indicated in symptomatic bradycardias (sinus dysfunction and AVB) whether permanent or paroxysmal. While the first pacemakers guaranteed 70 pulses per minute regardless of the patient's activity, today's pacemaker listens to what is happening in the heart, and only stimulates it when necessary, as spontaneous activity of the ventricle can thus be preserved.

The aim of our work is to study the epidemiological profile of patients with a pacemaker in the cardiology department of the Moulay Ismail Meknes military hospital in relation to 100 cases from January 2015 to March 2016, thus we will study the main etiologies having motivated the implantation of a pacemaker. The implantation techniques used and the complications of cardiac stimulation will also be described.

### Material and Method:-

Data was obtained by retrospective analysis of hospital records and operating records. For the medium and long-term results, we used the analysis of the consultation sheets. The data entry was done on Excel and analyzed using SPSS13 statistical software. We started with a descriptive study, then for the comparison of the percentages, we used the Chi-square test or Fisher's exact test according to the theoretical numbers.

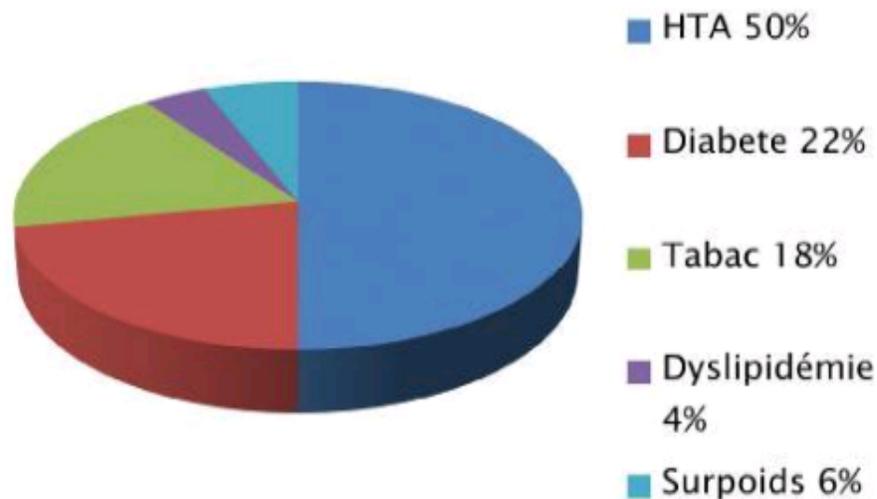
### Results:-

The study population includes 44 men and 56 women, representing a sex ratio of 0.7.

The average age of our population is 59.55 years old: 46% are over 63 years old. Female patients were significantly older than male patients.

Among the patients of our series (**Figure 1**):

1. 50% are hypertensive.
2. 22% are diabetic.
3. 18% are smokers.
4. 4% have dyslipidemia.
5. 6% are overweight.

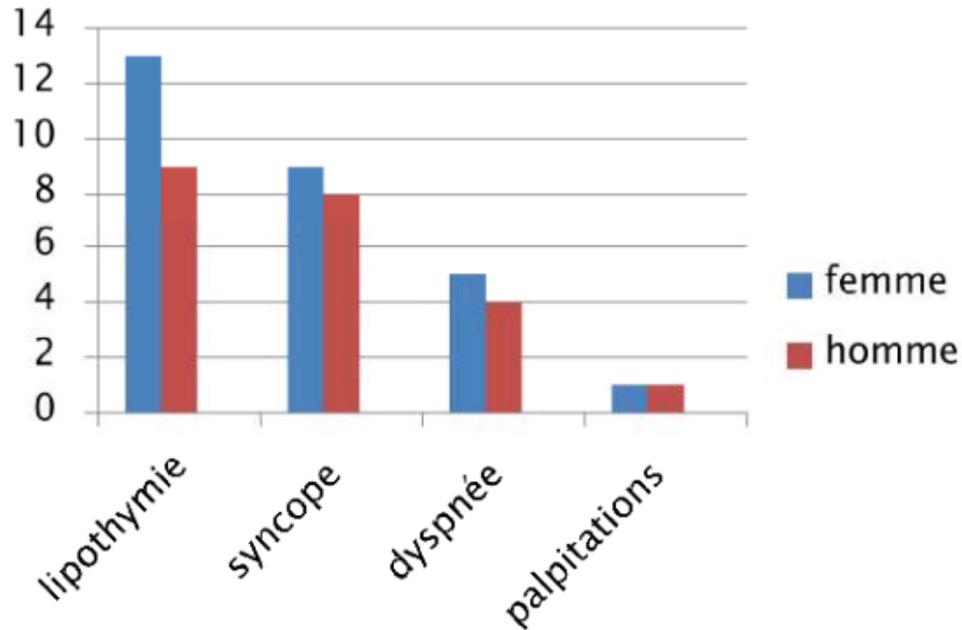


**Figure 1:-** Distribution of cardiovascular risk factor.

Morbid Association HTA-diabetes is found in 68 patients (34%).

The clinical signs studied are (**Figure 2**):

1. Lipothymia : 44 of the patients (44%)
2. Syncope : 34 of the patients (34%)
3. Dyspnea : 18 of the patients (18%)
4. Palpitations : 4 of the patients (4%)



**Figure 2:-** Distribution of clinical signs by sex.

These clinical signs are unequally distributed according to the gender, with significant difference :

>10 patients had acute coronary syndrome (ACS):

- 4 extensive anterior STEMI (ST segment elevation myocardial infarction)
- 4 postero-inferior STEMI
- 2 postero-inferior NSTEMI (non-ST segment elevation myocardial infarction)

>4 patients are followed for hypothyroidism on hormone replacement therapy.

>4 patients are followed for systemic lupus erythematosus.

>26 patients underwent open heart surgery, 10 of whom complied with a complete postoperative complete Atrio-Ventricular Block (AVB) and required the implantation of a permanent cardiac pacemaker. (**Table 1**).

PATIENTS	AGE	TYPE D'INTERVENTION
01	09 ans	Cure de CAV complet
02	09 ans	Cure de CAV complet
03	47 ans	Remplacement valvulaire Mitral
04	70 ans	Remplacement valvulaire Aortique
05	63 ans	Remplacement valvulaire Aortique

**Table 1:-** Cardiac surgery responsible of AVB.

The clinical examination on admission is normal in 89% of patients. A functional systolic murmur is found in 8% of cases. Peripheral signs of heart failure are present in 3% of patients.

The surface EKG found sinus rhythm in 88 patients and atrial fibrillation in 12 patients.

QRS complexes were thin in 66 patients and wide in 34 patients. The electrical disorders were paroxysmal in 10 patients and permanent in 90 patients. Complete AVB was the most common EKG finding (42%) (**Table 2**).

<b>Anomalies constatées sur l'électrocardiogramme de surface</b>	<b>Nombre de patients</b>
<b>BAV complet</b>	<b>21 ( 42%)</b>
<b>Bloc tri-fasciculaire</b>	<b>6( 12%)</b>
<b>BAV deuxième degré Mobitz2</b>	<b>6(12%)</b>
<b>BSA troisième degré</b>	<b>4(8%)</b>
<b>BAV deuxième degré Mobitz1</b>	<b>4(8%)</b>
<b>BSA deuxième degré</b>	<b>3(6%)</b>
<b>Bradycardie sinusale</b>	<b>1 (2%)</b>
<b>ECG normal</b>	<b>5(10%)</b>

**Table 2:-** Electrical anomalies found on the EKC.

The 24 hours rhythmic holter was performed on 10 patients. The main indication was symptomatic patients with a normal surface EKG. It revealed:

1. 3 Bi-fascicular Block
2. 2 Complete Atria-Ventricular Block

It was performed in 4 patients during the exploration of a congenital AVB, which revealed a chronotropic insufficiency in one patient.

Transthoracic Echocardiography was performed and the examination was normal for 28 patients. For the others, it showed:

1. Systolic dysfunction with stroke fraction lower than 40% on 18 patients (18%).
2. Leftventricle (LV) dilatation on 10 patients (10%).
3. Associated valvulopathy on 16patients (16%).
4. Heterogeneous contractility on 4 patients (4%)
5. Right ventricle (RV) on 20 patients (20%)

Degenerative conduction disorders are the main indication of pacemaker implantation in our series. There are 68 cases. Among these degenerative AVB, there are 22 men and 46 women.

In second place is found Ischemic origin and postoperative conductive disorders (10%).

Then conductive disorders of congenital origin in 16 patients. There are 4 isolated BAVs, and 4 associated with non-operated congenital heart disease (4 cases of partial CAV). Finally, conductive disorders secondary to systemic

disease on 8 patients (Figure 4). A temporary stimulation was performed on 30 patients (30%).

All patients are implanted by the endocavitary path. The right cephalic vein is the main path for 90 patients (90%). The pacemaker pocket was made pre-pectorally on 94 patients (94%) and retro-pectorally on 6 patients (6%).

70 patients (70%) were implanted in DDD mode, followed by VVI mode on 30 patients (30%).

The atrial leads were most often with active fixation. They are fixed antero-laterally on 62 patients (88%) and in the septal position on 8 patients (11%).

All ventricular lead are fixed on the inter-ventricular septum on 58 patients (58%), and 42 leads are fixed at the apex of the right ventricle (42%).

For primary implantation, the average length of stay was 4 days. The follow-up are organized as follows:

1. 10 days after PM implant: removal of wires
2. 2 months after PM implant: programming check
3. Every year after PM implant for monitoring which consists of:
4. Verifying the stimulation mode
5. Searching for end-of-life battery signs such as the elective replacement indicator
6. Changing the stimulation mode to the rescue VVI for the double chamber pacemaker
7. Finding occurrences of tachycardia by electronic reentry
8. Atrial fibrillation imposing the change of the mode of stimulation and the introduction of Vitamin K antagonists (VKA).

An early pre-operative or post-operative complication occurred on 12 patients (12%):

1. Displacement of the ventricular lead on 4 patients (4%)
2. Pneumothorax on 4 patients (4%)
3. Hematoma of the pacemaker pocket on a patient under VKA (mitral prosthetic valve).
4. Wall infection on a patient on day 6, this could be controlled with parage and antibiotherapy.

Late complications occurred in 6 patients (6%):

1. Pacemaker syndrome on 6 patients stimulated in VVIR mode
2. Pectoral stimulation in 2 patients.

### **Discussion:-**

Conductive atrioventricular disorders are mainly of interest to the elderly population. Indeed, more than 46% of patients are older than 63, a concept reported in other series with a age range of between 60-70 years according to BOUHOUC and 65-70 years according to THIAM [1].

There is a female predominance (56%) with a sex ratio equal to 0.78 in agreement with data from other studies, notably the series of THIAM [33] (sex ratio = 0.4) and SERDAR [34] (sex ratio = 1). This predominance in our series can be explained by life expectancy, which is higher among women in Morocco.

In our study, Hypertension is the most common cardiovascular risk factor (50%). This is correlated with the Kirsten journal [2] in a study of 2010 patients, which report a prevalence of hypertension, diabetes, smoking and dyslipidemia respectively 61%, 20%, 34% and 9% .

In addition, our study demonstrated a significant relationship between degenerative AVB and the HTA-diabetes association present in 34% of patients with degenerative AVB. The small size of our sample requires a study on a larger scale to confirm or deny this link.

The functional symptomatology made by syncope and equivalents of syncope (lipothymia) was the most frequent in our series (74%). These results are comparable to the studies of Gross [4] and THIAM [3]: Syncope is found in more than 50% of cases.

Permanent AVB Permanent AVBs are the most common electrical abnormality at admission in our patients

(62%), which is reported in most other studies [7,].

The indication of definitive cardiac pacing for sinus dysfunction has increased significantly in recent years, accounting for 50% of the indications in the USA and northern European countries, with the exception of France where it remains stable at around 35% [5]. In our series, implantation of a pacemaker for sinus dysfunction was performed in 16% of cases.

Comparing the etiological aspects chosen for our patients implanted with those in the literature, we found a good correlation. Hence:

1. The degenerative nature of conduction disorders is found in 70% to 86% of cases (68% in our series).
2. Myocardial infarctions (MI) in 5 to 9% of cases (10% in our series).
3. The surgical origin is found in 5% of cases (10% in our series). The incidence of postoperative AVB was reduced to 1-4% [8] with improved surgical techniques and better anatomical knowledge of cardiac conduction system.
4. Congenital origin in 3 to 5% of cases (8% in our series).

The two main indications justifying the implantation of a PM in our series are : 66% AVB and the 16% sinus node dysfunction. In total, we put 70% of dual-chamber pacemaker, and 30% of single-ventricular chamber pacemaker. On the other hand, no case of single atrial chamber pacemaker has been implanted in our series. These data matches exactly with the literature, since the experts put 70% of double-chamber pacemaker and 25% of single-chamber pacemaker.

Several studies, of which the most important is the "MOST Trial" [9] and the meta-analysis of Healey [10], demonstrated the advantages of DDD pacing mode over VVI mode, reducing significantly the risk of pacemaker syndrome, heart failure and atrial fibrillation. In addition, this meta-analysis allows the results distinction according to the indication (sinus node dysfunction or AVB) and concludes that the pacing mode mode is independent of the pacing indication.

From a technical stand point, all leads are currently implanted intravenously under local anaesthesia using either the cephalic vein or the subclavian vein.

The predominant choice of the subclavian pathway despite its potential danger from the cephalic approach was dictated by:

1. Mastering the puncture technique of subclavian vein.
2. The lower implantation time compared to the cephalic way.

Since the initial publication of Furman and Schwedel in 1959 [11], the right ventricle apex is considered to be the elective site of ventricular pacing. The advantages are clear with easy access and high stability of the passive fixation electrodes (the first produced) before the active fixation electrodes.

However, very soon the deleterious effects of apical right stimulation appeared. These are reflected in echocardiographic parameters and clinical events: death, heart failure, occurrence of atrial arrhythmias [12]. Septal stimulation does not appear to be more effective than apex RV stimulation in view of the results of the randomized "ROVA" study [13], at least in patients with heart failure.

Most ventricular leads are fixed in the interventricular septum in 58% of the patients, they were actively fixed. For the fixation of the atrial lead, the auricle and the lateral wall of the right atrium are the elective sites, given their stability and the absence of cross-talk. The limit of these sites is a long proarrhythmic atrial depolarization time. In our series, atrial probes are actively fixed in anterolateral position in 88% of patients.

Leads displacement is one of the most common complications of pacemakers. Its frequency tends to decrease with the new leads [14]. Displacement seems to be favored by the existence of very dilated heart cavities. The incidence of leads displacement varies from 2% to 2.6% depending on the series [15]. In our series, 4% of leads displacement was reported.

Pneumothorax is a classic complication of subclavian vein catheterization, 0.8 to 4% according to literature data

[16]. Its appearance may be delayed within 48 hours of implantation. In our series, pneumothorax was investigated systematically by a chest X-ray performed after the procedure and 4 cases were reported (4%).

Wall hematoma occurred in only 2 patients with mechanical valvular prosthesis. The AVK were arrested in the last 72 hours before implantation and a relay with enoxaparin. This joins the classic management attitude for perioperative anticoagulation [17].

In the literature, patients with pacemakers and defibrillators requiring long-term anticoagulation have been analyzed [18]. It showed that the VKA-heparin relay increases the risk of pocket hematoma and extends the duration of hospitalization compared to a strategy based on a transitional stop of VKA (48h), without relay by heparin. Nevertheless, VKA management is not yet consensual, and increased vigilance is required in each case.

Pacemaker syndrome is a non-exceptional hemodynamic complication of cardiac pacing. It can occur in single-chamber (AAI, VVI) or dual-chamber mode, but is more common in ventricular mono-chamber mode. The incidence of pacemaker syndrome varies from 1 to 3% depending on the series [19]. In our series, pacemaker syndrome was observed in 4 cases (4%), a rate consistent with data from the literature. The average time of onset is 15 months. The pacing mode was VVI.

We identified in our series only 2 cases of pocket infection at day 6. This rate varies in the literature between less than 1% and more than 10% [20]

A French multicenter study that followed 6319 implanted pacemaker patients in 44 centers for 12 months, noted the occurrence of an infection in 42 patients: an infection rate of 0.68% at one year [21]. Endocarditis is about 10% of these infections of implanted material.

For a given individual, the factors of quality of life change over time. In the short term, improvement is certain in the sense that the pacemaker suppresses the initial symptoms. [22] Medium and long-term interest poles may change. Physical activity is the fundamental element of the quality of life in the young subject, becoming more secondary with age. Our study shows a clear improvement of the quality of life after Pacemaker implantation, factors that are derived mainly from the evolution of the initial symptomatology:

1. 96% of our patients had syncope disappear after PM implantation (83 to 94% of syncope disappearance in the literature)
2. 4% kept having or showed syncope, related to a pacing probe displacement

The benefits of cardiac pacing for survival and prevention of recurrent symptoms have been demonstrated in several studies. It has also been shown that the survival of pacemaker implanted patients is lower than the general population. Age at the time of implantation, presence of cardiomyopathy, VVI stimulation mode, gender and heart valve disease are independent predictors of mortality after cardiac stimulation.

### **Conclusion:-**

It is particularly suitable for people of average age between 60 and 75 years, who have symptomatic degenerative AVB. The complications recorded in our study are superimposable to literature data. The effectiveness of the pacemaker depends on the appropriateness of the indication of its implantation.

Pacemakers are constantly evolving: new platforms, new algorithms, increased longevity. They help refine the diagnosis, improve the management of cardiac conduction disorder, and improve patient monitoring. The future still holds great progress, including pacemakers without endocavitary leads and physiological pacemakers.

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