

## Non-infectious complications of conventional cardiac stimulation at the cardiology service of the grand general hospital: retrospective study of 57 cases

### Research article

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### Abstract

**Objective:** Permanent cardiac stimulation remains the only effective treatment for symptomatic bradycardia. However, like any invasive gesture, it is not without risk. The aims of our study were to assess the non-infectious complications secondary to pacemaker implantation in the cardiology department of the Grand Yoff General Hospital.

**Results:** We had collected 57 cases of non-infectious complications inherent in cardiac stimulation, a prevalence of 23%. The average age of the patients was 70.5 and the sex ratio M/F was 0.9. The functional symptoms before implantation were dominated by dyspnea (42.1%) and dizziness (31.6%). The electrocardiographic anomalies found before implantation were dominated by the complete atrioventricular block (86.8%), sinus dysfunction (7.9%) and 2nd degree atrioventricular block (5.3%). Non-infectious complications that occurred early were noted in 38 cases, or 66.7%. They were dominated by displacement of probes, pneumothorax, hematoma of the pacemaker's lodge in 4.8%, 3.57% and 2.78% of the cases respectively. There were 19 late complications, or 33.3% of the cases. They consisted of arrhythmias (1.19%), heart failure (3.97%), probe displacement (1.19%), pacemaker dysfunction (0.79%) and diaphragmatic stimulation (0.4%).

**Methodology:** This is a retrospective study concerning the non-infectious complications of conventional cardiac stimulation in patients implanted with a pacemaker between January 1, 2006 and December 31, 2014 in the cardiology department of Grand Yoff General Hospital. The different parameters studied included socio-demographic, clinical, paraclinical data, and non-infectious complications secondary to definitive cardiac stimulation. Early complications are those observed in the first six weeks and late ones beyond six weeks after implantation. The data were analyzed using sphinx 4.5 software. The significance threshold was used for a value of  $P < 0.05$ .

**Conclusion:** In this study, non-infectious complications were dominated by pneumothorax and probe displacements. The frequency of non-infectious complications also remains high. Improving the technique and conditions of cardiac stimulation are the solution to these potentially serious complications.

### Keywords

conventional cardiac stimulation; non-infectious complications; Senegal

## Introduction

The pacemaker or pacemaker (PM) is an electrical pulse generator that stimulates the myocardium to establish a normal rhythm when the heart rate slows or a conduction defect occurs. It remains today the only possible means for the symptomatic treatment of bradycardias. However despite the technological advances it has known since its advent, the implantation of a stimulator exposes to a certain number of complications. These complications can be early occurring within the first six weeks or late infectious or non-infectious [1-5]. In the absence of a pacemaker registry in Africa in general and in Senegal in particular, these complications have been little studied [6]. So it was with this in mind that we carried out this work. The objectives of this study were to assess non-infectious complications, whether late or early, linked to the implantation of pacemakers in the cardiology department of the Grand Yoff General Hospital.

## Methodology

The study focused on the files of patients of both female and male sexes implanted with a conventional cardiac pacemaker in the cardiology department of Grand Yoff General Hospital during the study period. We had carried out a transversal, descriptive and retrospective study from January 1, 2006 to December 31, 2014, either a period of 8 years. Were included in our study, all the files of patients carrying a definitive pacemaker that it is about a first implantation or a reimplantation during the period of study and having presented during the hospitalization or the followed a non-infectious complication. Early complications are those observed in the first six weeks and late complications those occurring more than six weeks after implantation. Excluded from the study were patients who had pacemaker outside of the study period, patients carrying a pacemaker but having an infectious complication, and those fitted with a triple-chamber pacemaker or an implantable automatic defibrillator.

The different parameters studied included socio-demographic (age, sex, profession, address), clinical, paraclinical data (history, symptoms, physical examination, electrocardiogram and cardiac Doppler ultrasound data), indications for stimulation and data on definitive stimulation (mode, site, route first). The complications sought were those that were not infectious (pneumothorax, hematoma of the pacemaker compartment, hemothorax, gas embolism, vascular dissection, diaphragm or pectoral

stimulation, tamponade, rhythm disturbances, myocardial perforation, tube displacement, tube rupture, venous thrombosis, pacemaker dysfunction, heart failure). Data were collected from patient files and operative reports using an individual survey sheet entered on Microsoft world 2010. The quantitative variables were summarized as an average and standard deviations or as a median. The qualitative variables have been summarized in number and percentage. For the comparison of the percentages, we used the Chi-square test or the exact Fisher test according to the theoretical numbers. The significance threshold was used for a value of  $P < 0.05$ .

## Results

We had collected 57 cases of non-infectious complications inherent in definitive cardiac stimulation on 252 implantations, either a prevalence of 23%. The average age of the patients was 70.5+ 15.41 with extremes of 15 and 86 years. We noted a female predominance with a sex ratio M/F was 0.9. Hypertension was the main cardiovascular antecedent (65.8%) followed by diabetes (26.3%) and dyslipidemia (2.6%). The functional symptoms before implantation were dominated by dyspnea (42.1%) and dizziness (31.6%). On physical examination, all patients had bradycardia with an average heart rate of 40 beats per min. The electrocardiographic anomalies found before implantation were dominated by the complete atrioventricular block (86.8%), sinus dysfunction (7.9%) and 2nd degree atrioventricular (5.3%). Non-infectious complications that occurred early were noted in 38 cases, or 66.7%. They were represented mainly by the pneumothorax with 3.5% of the patients (9 cases), detected in all the patients in the first four days following the implantation and the hematoma of the pacemaker's compartment following an accidental arterial puncture observed in 2.8% of cases (7 patients), 3 of whom were on anticoagulants.

The other early non-infectious complications were represented by the hemothorax confirmed by a thoracic computed tomography with 2 cases (0.8%), the early displacement of the probe with 12 cases or 4.8% of the patients (displacements interested the ventricular probe in 8 either 3.2% and the ear probe in 4 cases either 1.6%), 1 case (0.4%) of venous thrombosis of the left subclavian vein which occurred early at 21 days after implantation and one case fixed conduction atrial flutter. Early dysfunction of the stimulation device was also observed

in 2 cases (0.8%) including a defective pacemaker and a defect in stimulation of the ventricular probe. An increase in the ventricular pacing threshold was observed in 2 cases (0.8%) as well as two cases of diaphragmatic pacing (0.8%). There were 19 late non-infectious complications, or 33.3% of the cases. They were dominated by heart failure with 10 cases (3.97%), arrhythmia with 3 cases or 1.2%, in the form of atrial fibrillation, pacemaker dysfunction in 2 cases including one case of externalization secondary to a trauma and one case of stimulation failure, late movement of the probe with 3 cases including an ear probe and finally 1 case of diaphragmatic stimulation occurring 6 months after implantation.

## Discussion

The prevalence of complications from pacing in our study was 26.19%. In the study by KLUG et al., [6] the complication rate was 8.9%. This frequency was significantly lower than that of our study. Atrioventricular conduction disorders affected more than 50% of patients aged over 70 years. This is correlated with data from the literature, which reports a linear physiological relationship between age and the occurrence of conduction disorders [7]. The female predominance in our work (52%) was similar to the results of HORIY et al in Japan [8] which were 52.9%. Our findings are different from those of several other series which found a male predominance [9-11]. The main cardiovascular history found was hypertension (59.6%) and diabetes (21.2%). A similar percentage was found in China with FANG [12]. The functional symptomatology in our study was dominated by dyspnea (51.9%) and dizziness (44.2%) while in the Dwivedi series [11] syncope was the main symptom (80%). Permanent atrioventricular block was the main indication for cardiac stimulation (78.8%) and these results are correlated with the sub-Saharan and Turkish series [7,13,14]. The degenerative etiology represented the most frequent cause of chronic atrioventricular block and is observed in more than 75% of cases in subjects aged over 65 years [15]. In our serie (51.9%) as in most registers the etiology was degenerative [7, 14,16]. Some complications of cardiac stimulation are classic catheterizations of the subclavian vein and arise all the more readily since the search for the vein has been laborious [17]. Pneumothorax is a classic complication of catheterization of the subclavian vein with a frequency that varies between 0.8 and 4% according to the data in the literature [18].

In our series the percentage of pneumothorax (3.5%) was identical to that of RICHARD [19] who found 3.7% of cases. On the other hand SDIRI [16], SLIMANE et al [20] found much lower rates with 1.59% and 0.3% respectively. The hematoma of the pacemaker's lodge was found in 7 of our patients, either 2.8%, while HATEM [14], in its study, noted 8 cases of hematomas during the first implantation (3.4% ) and only one case of hematoma during the change of case (1.6%) and SLIMANE et al [20] observed a prevalence of 3%. Hemothorax was noted in 2 of our patients 0.8%) while in the series of AGGARWAL et al, it was the most common preoperative complication (27 patients).

The early movements of probes were frequent in our study found in 12 patients or 4.8%. In the study by SLIMANE et al [20], the early displacements of the probe were 9%, involved in 6% of the cases the ear probe and 3% of the cases the ventricular probe. This complication is found in 1.5% of cases in the French series of TIBI [21], 7.6% in the African series of THIAM [7] and 2.9%. In that of HATEM et al [6]. Subclavian vein thrombosis is observed in 30 to 45% of patients following implantation [4].

In our series we report 1 (one) case (0.4%) and KANE et al [6] report two cases of deep vein thrombosis of the upper limbs on a pacemaker. Early pacemaker dysfunction in our series was observed in 1.6% of cases while it was 3% in the study by HATEM et al [14] and AGGARWAL et al [1] noted a listening defect in 0.9% of cases. Late non-infectious complications are not only poorly understood, but also underestimated, less quantified and very numerous [21]. These complications can be mechanical (related to the probes), venous, hemodynamic, rhythmic, or complications preventing the pacemaker from ensuring its stimulation function [4]. In our series, the results of late probe displacements (1.2%) were identical to those of HATEM et al [14], 1.5%, but were much more important in the study of FALASE et al [22] (5,9%).

## Conclusion

Infectious complications remain numerous and sometimes even underestimated in their frequency. However, they often remain favorable. At the cardiology department of cardiology of the Grand Yoff General Hospital, the rate of complications is still correlated with data from the literature. The benefit of stimulation in terms of survival, care and development remains satisfactory. Despite complications, cardiac

stimulation still helps to maintain lives and improves the quality of life of patients suffering from bradycardia during conduction disorders.

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