



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكرو فيلم

# بسم الله الرحمن الرحيم



**HANAA ALY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم



# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



**HANAA ALY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

### قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



### يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



**HANAA ALY**



# **Incidence of documented atrial arrhythmias in patients with dual chamber cardiac implantable devices**

Thesis

*Summited for Partial Fulfillment of Master Degree in Cardiology*

By

**Mai Mahmoud Ahmed Elsayed Ellaban**

*M.B.B.Ch.*

Under supervision of

**Prof. Dr. Ayman Mortada Abd El Moteleb Mohamed**

*Professor of Cardiology*

*Faculty of Medicine, Ain Shams University*

**Dr. Hassan Shehata Hassan Eldawy**

*Lecturer of Cardiology*

*Faculty of Medicine, Ain Shams University*

**Dr. Azza Ali Hassan Katta**

*Assistant Consultant of Cardiology*

*National Heart Institute*

*Faculty of Medicine*

*Ain Shams University*

*2021*



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# قَالَ

سَبِّحْكَ لَا إِلَهَ إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ  
الْعَلِيمُ الْعَظِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

# Acknowledgment

*First and foremost, I feel always indebted to **ALLAH**,  
the Most Kind and Most Merciful.*

*I'd like to express my respectful thanks and profound  
gratitude to **Prof. Dr. Ayman Mortada Abd El Moteleb  
Mohamed**, Professor of Cardiology, Faculty of Medicine, Ain  
Shams University for his keen guidance, kind supervision,  
valuable advice and continuous encouragement, which made  
possible the completion of this work.*

*I am also delighted to express my deepest gratitude and  
thanks to **Dr. Hassan Shehata**, Lecturer of Cardiology,  
Faculty of Medicine, Ain Shams University, for his kind care,  
continuous supervision, valuable instructions, constant help and  
great assistance throughout this work.*

*I am deeply thankful to **Dr. Azza Katta**, Assistant  
Consultant of Cardiology, National Heart Institute, for her great  
help, active participation and guidance.*

**Mai Ellaban**

# List of Contents

Title	Page No.
List of Abbreviations.....	i
List of Tables .....	iii
List of Figures .....	v
Introduction .....	1
Aim of the Work.....	5
Review of Literature	
Cardiac Implantable Electronic Devices (CIED).....	6
Atrial Arrhythmias .....	22
Patients and Methods.....	53
Results .....	58
Discussion .....	91
Limitations.....	101
Conclusion .....	102
Recommendations .....	103
Summary .....	104
References .....	107
Arabic Summary .....	—

# List of Abbreviations

Abb.	Full term
AF .....	Atrial fibrillation
AFL.....	Atrial flutter
AHRE .....	Atrial high rate episodes
AT .....	Atrial Tachycardia
AV .....	Atrioventricular
AVNRT .....	AV nodal re-entry
AVRT .....	AV re-entry via concealed bypass tract
BMI.....	Body mass index
CI .....	Confidence intervals
CIED.....	Cardiac implantable electronic devices
CRT.....	Cardiac resynchronization therapy
DC shock .....	Direct Current defibrillator
DDD.....	Dual chamber Device
DM .....	Diabetes Mellitus
ECG .....	Electrocardiogram
EF .....	Ejection Fraction
HbA1c.....	Hemoglobin A1c
HF.....	Heart failure
HR.....	Hazard Ratio
ICD .....	Implantable cardioverter defibrillator
ICH .....	Intracranial Hemorrhage
IHD .....	Ischemic heart disease
INR .....	International Normalized Ratio
LA.....	Left atrium
LAA.....	Left atrial appendage
LVIDd.....	Left ventricular internal dimensions (Diastole)



# List of Abbreviations Cont...

Abb.	Full term
LVIDs .....	Left ventricular internal dimensions (Systole)
MOST .....	Mode Selection Trial
NOAC .....	Non-vitamin K antagonist Oral Anticoagulant
OAC .....	Oral Anticoagulants
OR.....	Odds ratio
PMT.....	Pacemaker-mediated tachycardia
PREVAIL.....	Prospective Randomized Evaluation of the Watch-man LAA Closure Device In Patients with AF Versus Long Term Warfarin Therapy trial
PSVT.....	Paroxysmal supraventricular tachycardia
r tPA .....	recombinant tissue plasminogen activator
ROC .....	Receiver operating characteristic curve
AUC .....	Area Under Curve
SA node .....	Sino-Atrial Node
SCAF .....	Subclinical AF
SEC.....	spontaneous echo contrast
SSS .....	Sick sinus syndrome
TEE.....	Trans-esophageal echocardiography
TIA.....	Transient ischemic attacks
TTR.....	Time in therapeutic range
VKA .....	Vitamin K antagonist

# List of Tables

Table No.	Title	Page No.
Table (1):	The NBG Code NASPE/BPEG Generic.....	9
Table (2):	Types of AF .....	33
Table (3):	Clinical types of atrial fibrillation .....	35
Table (4):	LADS score.....	37
Table (5):	CHADS2 and CHA2DS2-VASc score .....	37
Table (6):	Demographic data and characteristics of the studied patients .....	59
Table (7):	Descriptive of CHADSVASC score, medications, AHREs attacks and devices of the studied patients. ....	62
Table (8):	Descriptive of echocardiographic data and labs of the studied patients. ....	66
Table (9):	Comparison between the two groups regarding age, sex and occupation .....	68
Table (10):	Comparison between the two groups regarding body built, habits and associated diseases.....	69
Table (11):	Descriptive of medications, CHADSVASC score and devices of the studied patients.....	71
Table (12):	Descriptive of echocardiographic data and labs of the studied patients.....	73
Table (13):	Descriptive of associated diseases, medications and echocardiographic data.....	75
Table (14):	Comparison between two groups regarding age, sex and occupation.....	76
Table (15):	Comparison between the two groups regarding body built, habits and associated diseases.....	77
Table (16):	Descriptive of medications, CHADSVASC score and devices of the studied patients.....	79

## List of Tables Cont...

Table No.	Title	Page No.
<b>Table (17):</b>	Descriptive of echocardiographic data and labs of the studied patients. ....	81
<b>Table (18):</b>	Descriptive of associated diseases, CHADSVASC score, medications, echo data of the two groups. ....	83
<b>Table (19):</b>	Descriptive of age, sex and occupation of the studied patients. ....	84
<b>Table (20):</b>	Descriptive of body built, habits and associated diseases of the studied patients. ....	85
<b>Table (21):</b>	Comparison between the three groups as regard medications, CHADSVASC score and devices. ....	86
<b>Table (22):</b>	Comparison between the three groups as regard echo data and labs. ....	89

# List of Figures

Fig. No.	Title	Page No.
Fig. (1):	First pacemaker.....	7
Fig. (2):	Pacemaker components.....	9
Fig. (3):	Classification of tachycardias.....	23
Fig. (4):	Diagnosis of AHRE/subclinical AF.....	32
Fig. (5):	HATCH score.....	36
Fig. (6):	Acute and chronic management of atrial fibrillation .....	40
Fig. (7):	Shows the CHA2DS2-VASc score and the relation between these risks scores and the annual risk of stroke.....	41
Fig. (8):	Stroke prevention in atrial fibrillation.....	42
Fig. (9):	Initiation or continuation of anticoagulation in atrial fibrillation patients after a stroke or transient ischaemic attack .....	47
Fig. (10):	Acute heart rate control.....	50
Fig. (11):	Long term heart rate control .....	51
Fig. (12):	Sex distribution among the studied patients.....	60
Fig. (13):	Occupation of the studied patients.....	60
Fig. (14):	Clinical data of the studied patients.....	61
Fig. (15):	Medications of the patients.....	64
Fig. (16):	ECG of the patients .....	64
Fig. (17):	Type of devices .....	65
Fig. (18):	Descriptive of diabetic status of the studied patients.....	70
Fig. (19):	Descriptive of IHD in the studied patients. ....	70
Fig. (20):	Echocardiographic data of the studied patients.....	74
Fig. (21):	Diabetic status of the studied patients. ....	78
Fig. (22):	IHD in the studied patients.....	78
Fig. (23):	CHADSVASC score of the studied patients.....	80

## List of Figures Cont...

Fig. No.	Title	Page No.
Fig. (24):	Echo data of the studied patients .....	82
Fig. (25):	CHADSVASC score of the studied patients. ....	88
Fig. (26):	EF and LA diameter of the three groups. ....	90
Fig. (27):	LVIDd and LVIDs of the three groups. ....	90

## INTRODUCTION

Permanent pacemakers are implanted to prevent or treat bradycardia caused by disorders of the cardiac conduction system (*John, 2020*).

For more than 15 years, there have been two broad types of pacing systems: single chamber (ventricular) and dual chamber. The selection of either a single- or a dual-chamber pacemaker has clinical and economic implications (*Albatat et al., 2020*).

Single-chamber ventricular pacing prevents bradycardia and death from ventricular standstill, but dual-chamber pacing better emulates normal cardiac physiology by restoring atrioventricular synchrony and matching the ventricular pacing rate to the sinus rate. As a result, dual-chamber pacing, as compared with single-chamber ventricular pacing, improves hemodynamic function (*Toff et al., 2005*).

The DDD mode of dual-chamber cardiac pacing provides for sensing and pacing capabilities in both the atrium and ventricle, and for coordinated activity between the chambers (*Palaksha et al., 2020*).

The application of pacemakers was extended to heart failure treatment using bi-ventricular pacing (cardiac resynchronization therapy, CRT), and now, CRT-D (cardiac resynchronization therapy with an implantable cardioverter



defibrillator [or ICD] function), effectively preventing sudden cardiac death, are now being used in clinical settings (*Ismail et al., 2020*).

An implantable cardioverter defibrillator (ICD) is a device that monitors and responds to heart activity. ICDs have modes for pacing, wherein the device periodically sends a small electrical stimulus to the heart, and for defibrillation, wherein the device sends a larger shock to restore normal heart rhythm (*Cao et al., 2020*).

Complications include infection; perforation, displacement, fracture, or insulation breakdown of the leads; oversensing or undersensing of the arrhythmia; and inappropriate shocks for sinus tachycardia or supraventricular tachycardia. Psychological problems are common, and counselling plays an important role. Regular follow up is required (*Houghton et al., 2003*).

Atrial high rate episodes (AHREs) detected by cardiac implantable electronic devices (CIEDs) are associated with an increased risk of stroke. However, the impact of AHRE on improving stroke risk stratification scheme remains uncertain (*Khan et al., 2020*).

Atrial fibrillation (AF) is the most common sustained arrhythmia, and is associated with increased risks of morbidity and mortality (*Farah et al., 2020*).