# Cardiac implantable electric device (CIED) - related complications

# (Ain Shams Registry)

Thesis for partial fulfillment of the Master degree in Cardiology submitted by

**Sherif Mohammad Aziz Altoukhy**

M.B.B.Ch., AinShamsUniversity

Under supervision of

**Professor Doctor/ Mohammad Gamal Aly Abd Albar**

Professor of Cardiology,AinShamsUniversity

**Doctor/ Ayman Mortada Abd El-Motaleb**

Lecturer of Cardiology, AinShamsUniversity

**Doctor/ Ahmed Mohamed El Missiri**

Lecturer of Cardiology, AinShamsUniversity

AinShamsUniversity

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# List of abbreviations

| | |
|---|---|
| **%** | Percentage |
| **(r)** | Pearson's correlation coefficient |
| **ACC** | AmericanCollege of Cardiology |
| **AF** | Atrial fibrillation |
| **AHA** | American Heart Association |
| **ARVD** | Arrhythmogenic right ventricular dysplasia |
| **ASD** | Atrial septal defect |
| **AV** | Atrioventricular |
| **BBB** | Bundle branch block |
| **BP** | Blood pressure |
| **BPEG** | British Pacing and Electrophysiology Group |
| **bpm** | Beat per minute |
| **CA** | Coronary angiography |
| **CDRI** | Cardiac device related-infection |

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|---|---|
| **CDRIE** | Cardiac device related infective endocarditis |
| **CHB** | Complete heart block |
| **CHF** | Chronic heart failure |
| **CIED** | Cardiac implantable electric device |
| **Cong. CHB** | Congenital complete heart block |
| **CRT** | Cardiac resynchronization therapy device |
| **CRT-D** | CRT with defibrillator function |
| **CRT-P** | CRT with pacemaker function |
| **D** | Day |
| **DBT** | Device-based therapy |
| **DCM** | Dilated cardiomyopathy |
| **DDD** | Dual chamber pacemaker (pacing & sensing RA & RV) with dual mode of response |
| **DDD-R** | Dual chamber pacemaker (pacing & sensing RA & RV) with dual mode of response, and with rate responsiveness |
| **DDI** | Dual chamber pacemaker (pacing & sensing RA & RV) with only inhibitory mode of response |
| **DM** | Diabetes mellitus |

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| **ECG** | Electrocardiogram |
| **EF** | Ejection fraction |
| **ELT** | Endless loop tachycardia |
| **EMI** | Electromagnetic interference |
| **ESC** | European Society of Cardiology |
| **FH** | Family history |
| **GDMT** | Guideline-directed medical treatment |
| **HB** | Heart block |
| **HCM** | Hypertrophic cardiomyopathy |
| **HF** | Heart failure |
| **HOCM** | Hypertrophic obstructive cardiomyopathy |
| **HR** | Heart Rate |
| **HRS** | Heart Rhythm Society |
| **HTN** | Hypertension |
| **ICD** | Implantable cardioverter defibrillator device |
| **ICM** | Ischemic cardiomyopathy |
| **LA** | Left atrium |

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| **LV** | Left ventricle |
| **LVEF** | Left ventricle ejection fraction |
| **M** | Month |
| **MI** | Myocardial infraction |
| **ml** | Milliliter |
| **Msec** | Milliseconds |
| **MTR** | Maximum tracking rate |
| **MVR** | Mitral valve replacement |
| **NASPE** | North American Society of Pacing and Electrophysiology |
| **NYHA** | New York Heart Association |
| **P wave** | Atrial depolarization wave |
| **PFO** | Patent foramen ovale |
| **PMT** | Pacemaker-mediated tachycardia |
| **Postop. CHB** | Postoperative complete heart block |
| **PPCM** | Peripartum cardiomyopathy |
| **PPM** | Permanent pacemaker |

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|---|---|
| **PVARP** | Postventricular atrial refractory period |
| **PVC** | Premature ventricular contractions |
| **QRS complex** | Ventricular depolarization |
| **RA** | Right atrium |
| **RV** | Right ventricular |
| **SA** | Sinoatrial |
| **SCA** | Sudden cardiac arrest |
| **SCD** | Sudden cardiac death |
| **SND** | Sinus node dysfunction |
| **SVCS** | Superior vena cava syndrome |
| **SD** | Standard deviation |
| **sec** | Second |
| **T wave** | Ventricular repolarization wave |
| **TEE** | Transesophageal echocardiography |
| **TTE** | Transthoracic echocardiography |
| **VA** | Ventriculoatrial |

| | |
|---|---|
| **VDD** | Single chamber pacemaker pacing and sensing the RV,<br>only sensing the RA |
| **VOO** | Single chamber pacemaker, pacing the RV without sensing |
| **VSD** | Ventricular septal defect |
| **VT** | Ventricular tachycardia |
| **VVI** | Single chamber pacemaker pacing & sensing RV, with inhibitory mode of response |
| **VVI-R** | Single chamber pacemaker pacing & sensing RV, with inhibitory mode of response, and rate responsiveness |
| **y** | Year |

# List of tables

**Table 23***:* Complications in patients with dual chamber device

**Table 24***:* Complications in patients with single chamber device

**Table 25***:* Complications in patients with CRT

**Table 26***:* Complications in patients with ICD

# List of figures

# Introduction

Several classifications for cardiac implantable electric device (CIED) complications exist, they can be classified according to implantation time into acute (immediate) or chronic, according to the site of complication into lead or pocket complications, and according to etiology into implantation or system failures. Implantation-related complications are the most common. ***[Gul & Kayrak, 2011]***

CIED implantation is a safe procedure, but these complications can happen even with experienced operators. ***[Gul & Kayrak, 2011]***

There is only limited information available about the complications related to modern CIED. Most of the existing data are based on the 1970s and are no longer valid for current practice. The recent reports on CIED complications are focused on some specific complications or are restricted to early complications. ***[Kiviniemi et al., 1999]***

In a retrospective study reviewing 446 patients who had received permanent endocardial pacemakers in which, attention was paid to the occurrence of any complication during

implantation or follow-up; early complications were detected in 6.7% of patients, while late complications occurred in 7.2% of the patients. Complications related to the implantation procedure occurred in 3.1%. Inadequate capture or sensing was observed in 7.4% of the patient. ***[Kiviniemi et al., 1999]***

Complications of CIED include those related to pacing system malfunction (such as oversensing, undersensing, loss of capture, loss of output, inappropriate mode, inappropriate rate, pacemaker-mediated tachycardia, pacemaker syndrome & true generator failure), early lead related complications (such as perforation, malposition, dislodgement and diaphragmatic stimulation, whereas pocket-related complications include hematoma, skin erosion, wound pain & infection) and delayed lead complications (such as venous thrombosis, exit block, insulation failure and conduction failure. Late lead damage can be reduced by cephalic and axillary venous access). ***[Trochman et al., 2004]***

# Aim of work

The aim of this is study is to register and analyze cardiac implantable electric device (CIED) related complications in patients presenting to the CIED programming clinic at Ain shams University Hospitals.