Acute Cardiac Arrhythmias in ICU
Causes and Management

Essay

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بسم الله الرحمن الرحيم

(قَالُواْ سُبْحَانَكَ لاَ عِلْمَ

لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ

أَنتَ الْعَلِيمُ الْحَكِيمُ)

صدق الله العظيم

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List of abbreviations

ACC : American College of Cardiology.

AHA : American Heart Association.

AF : Atrial Fibrillation.

Af : Atrial flutter.

APs : Accessory pathways.

A-V block : Atrio ventricular block.

AV node : Atrio ventricular node.

AVRTs : Atrio ventricular reentrant tachycardias.

AVNRTs : Atrio ventricular nodal reentrant tachycardias.

BNP : Brain natriuretic peptide.

BUN : Blood urea nitrogen.

CAD : Coronary artery disease.

CHF : Congestive heart failure.

CK : Creatinine kinase.

COPD : Chronic obstructive pulmonary disease.

DAD : Delayed after depolarizations.

DC : Direct current.

EAD : Early after depolarization.

ECG : Electrocardiogram.

ESC : European Society of cardiology.

HTN : Hypertension.

HR : Heart rate .

ICU : Intensive Care Unit.

IV : Intravenous.

LA : Left atrium.

LAFB : Left anterior fascicular block.

LBBB : Left bundle branch block.

LGL : Lown Ganong Levine Syndrome.

LPFB : Left posterior fascicular block.

LV : Left ventricle.

LVH : Left ventricular hypertrophy.

MAP : Monophasic action potential.

MAT : Multifocal atrial tachycardia.

MI : Myocardial infarction.

OAC : Oral anticoagulant.

PVCs : Premature ventricular complexes.

RA : Right atrium.

RBBB : Right bundle branch block.

RV : Right ventricle

SAN : Sinoatrial node.

SND : Sinus node dysfunction.

SVC : Superior vena cava.

SVT : Supra ventricular tachycaedia.

VT : Ventricular tachycardia.

VF : Ventricular fibrillation.

WPW : Wolf Parkinson White syndrome.

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Introduction

Introduction

Arrhythmia or dysrhythmia is an umbrella term used to describe a number of conditions where the heart beats are too slowly , too rapidly or irregularly because of disturbance of normal heart electrical activity ***(Barsky et al.,2008).***

Cardiac arrhythmias are a common problem encountered in the intensive care unit (ICU) and represent a major source of morbidity and they lengthen hospital stay. Not all arrhythmias seen in the ICU are of new onset as some patients have preexisting arrhythmias that can be exacerbated by their critical illness. Such arrhythmias often need continued or additional treatment while the patient is in the ICU ***(Sergei Goodman et al.,2008).***

Chapter Three

Mechanisms of cardiac arrhythmias

Mechanisms of cardiac arrhythmias

The mechanisms responsible for cardiac arrhythmias are generally divided into categories of disorders of impulse formation (automaticity and triggered activity), disorders of impulse conduction (reentry), or combinations of both. Reentry is the likely mechanism of most recurrent clinical arrhythmias ***(Issa Milleer ., 2009)***.

Diagnosis of the underlying mechanism of an arrhythmia can be of great importance in guiding appropriate treatment strategies. it can be difficult to distinguish among several mechanisms that appear to have a focal origin with centrifugal spread of activation (automaticity , triggered activity, reentry). This is further complicated by the fact that some arrhythmias can be started by one mechanism and perpetuated by another **(*Swanton and S Banerjee ., 2008)*.**

I. Disorders of impulse formation

The term impulse initiation is used to indicate that an electrical impulse can arise in a single cell or a group of closely coupled cells through depolarization of the cell membrane and, once initiated, can spread through the rest of the heart. There are two major causes for the impulse initiation that can result in arrhythmias ., automaticity and triggered activity. Each has its own unique cellular

mechanism that results in membrane depolarization***(A John Cam et al ., 2005).***

(1) Automaticity : Automaticity or spontaneous impulse initiation, is the property of cardiac cells to undergo spontaneous diastolic depolarization (phase 4 depolarization) and initiate an electrical impulse in the absence of external electrical stimulation. Altered automaticity can be caused by enhanced normal automaticity or abnormal automaticity ***(A John Cam et al ., 2005).***

Enhanced normal automaticity :

Refers to the accelerated generation of an action potential by normal pacemaker tissue and is found in the primary pacemaker of the heart, the sinus node, as well as in certain subsidiary or latent pacemakers that can become the functional pacemaker under certain conditions. Impulse initiation is a normal property of these latent pacemakers ***(A John Camm et al .,2005)***.

Abnormal Automaticity:

Abnormal automaticity occurs in cardiac cells only when there are major abnormalities in their transmembrane potentials, in particular in steady-state depolarization of the membrane potential. This property of abnormal automaticity is not confined to any specific latent