Patient with cardiomyopathy for non-cardiac Surgery: anesthetic consideration

An Essay
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Abstract

Cardiomyopathy is a disease of the myocardium associated with cardiac dysfunction and can be classified based upon the predominant pathophysiological features into dilated, hypertrophic, restrictive and arrhythmogenic right ventricular cardiomyopathy.

Anesthetic management of patients with cardiomyopathy for non- cardiac surgery is associated with a high morbidity and mortality and therefore requires careful planning, preparation and monitoring.

Key word

Cardiomyopathy

Anesthesia

Contents

List of Abbreviations

ACEI	angiotensin converting enzyme inhibitor
AF	atrial fibrillation
AHA	The American Heart Association
ARVD/C	arrhythmogenic right ventricular dysplasia/cardiomyopathy
AVN	atrioventricular node
BSA	body surface area
CHF	congestive heart failure
CI	cardiac index
CO	cardiac output
CS	cesarean section
CSE	combined spinal epidural anesthesia
CVP	central venous pressure
DCM	dilated cardiomyopathy
DO2	oxygen delivery
ECG	Electrocardiogram
EF	ejection fraction
GA	general anesthesia
HCM	hypertrophic cardiomyopathy
HF	heart failure

HOCM	hypertrophic obstructive cardiomyopathy
HR	heart rate
ICD	implantable cardioverter defibrillator
IVS	interventricular septum
JVP	jugular venous pressure
LA	left atrium
LAD	left anterior descending artery
LAP	left atrial pressure
LCX	left circumflex artery
LV	left ventricle
LVEDP	left ventricular end-diastolic pressure
LVEF	left ventricular ejection fraction
LVH	left ventricular hypertrophy
LVOT	left ventricular outflow tract
MR	mitral regurge
MRI	magnetic resonance imaging
NYHA	New York Heart Association
PACU	post anesthesia care unit
PVR	pulmonary vascular resistance
PCWP	pulmonary capillary wedge pressure
PDA	posterior descending artery

PONV	postoperative nausea and vomiting
RCA	right coronary artery
RCM	restrictive cardiomyopathy
RV	right ventricle
SAM	systolic anterior motion
SAN	sinoatrial node
SV	stroke volume
SVR	systemic vascular resistance
TR	tricuspid regurge
WHO	World Health Organization

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Introduction

The awareness of cardiomyopathies in both the public and medical zccommunities historically has been impaired by persistent confusion surrounding definitions and nomenclature **(Wynne et al., 2005).**

Cardiomyopathies are defined by the World Health Organization (WHO) in1995 as ‘a disease of the myocardium associated with cardiac dysfunction’ and are classified based on their predominant pathophysiological features into dilated, hypertrophic**,** restrictive, arrhythmogenic right ventricular, or unclassified **(Richardson et al., 1996).**

The American Heart Association (AHA) in 2006 issued a consensus statement and revised classification based on genetics, heart structural changes, cellular events, and multi-organ involvement **(Maron et al., 2006).**

Cardiomyopathy is associated with a significant risk for anesthesia. In addition, cardiac arrest under anaesthesia has been attributed to an undiagnosed Cardiomyopathy. Care of these patients is complicated by the fact that there are several different forms of cardiomyopathy (CM)

that have different anaesthesia management goals, aimed at maintaining the patient's baseline hemodynamic variables of preload, heart rate, contractility, and afterload. With the emergence of new diagnostic tools, together with advances in cardiac imaging and improved treatment modalities, the anesthetic management of Cardiomyopathy is evolving **(Ing R J et al., 2012).**

Changes in cardiovascular function during general anesthesia are due to many factors, including direct effects of the anesthetic agent(s) and indirect effects mediated primarily through the autonomic nervous system. The interplay of these several variables may produce changes in arterial and central venous pressures (CVP), cardiac output (CO), rate and rhythm. To minimize the risk of operation in patients with a compromised cardiovascular system, it is essential to minimize these changes **(De Hert GS, 2009).**

The choice of the anesthetic approach and the specific anesthetic agents to be used should be made by a qualified anesthesiologist, after careful evaluation of the patients' medical and cardiac condition. Thus, the skill and experience of the anesthesiologist, including the ability to monitor hemodynamics and respond quickly are very important to avoid the development of major clinical complications **(Morgan et al., 2006).**

The aim of this essay is to spot light on the difference in morphologic and hemodynamic features of each type of cardiomyopathy and to clarify the optimum anesthetic plan for peri-operative management of each type of cardiomyopathy, putting in mind that giving the management of one type of cardiomyopathy to another type may put the patient in a high risk.

Chapter (I)

Anatomy Of The Heart

The heart is a hollow muscular organ, situated in the middle mediastinum, where it is partially overlapped by the neighboring lungs. The sternum and costal cartilages of the third, fourth and fifth ribs overlie the heart anteriorly. About two-thirds of the heart is to the left of the midline. The heart rests on the diaphragm and is tilted forwards and to the left so that the apex is anterior to the rest of the heart **(Edwards, 1995)**.

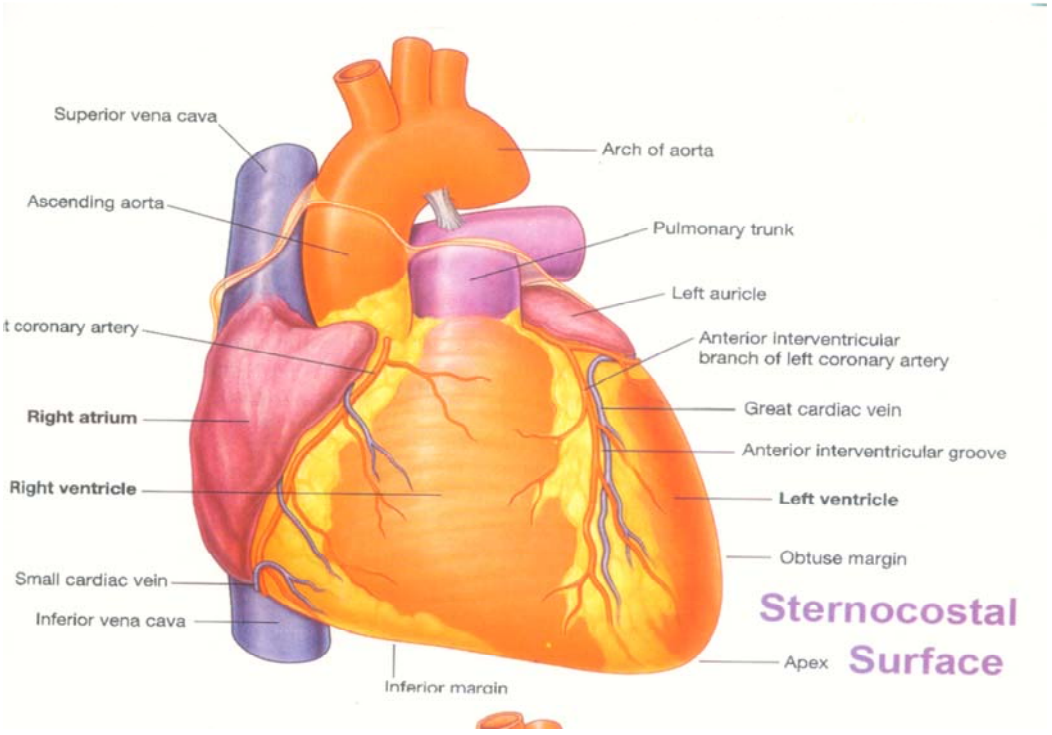

Figure (1): Sternocostal Surface of the Heart and Great Vessels

(Grant, 2005)

- **The Right Atrium:**

The inferior vena caval blood flow is directed by the eustachian valve towards the foramen ovale, and the superior vena caval blood is directed towards the tricuspid valve **(Edwards, 1984)**.

A prominent internal muscle ridge, the crista terminalis, separates the right atrial free wall into a smooth-walled posterior region that receives the venae cavae and coronary sinus and a muscular anterior region that is lined by parallel pectinate muscles and from which the right atrial appendage emanates **(Edwards, 1991)**.