Anesthetic Management of Cardiomyopathic Patients Undergoing Non-Cardiac Surgery

Essay
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The Master ***Degree in Anesthesiology***

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Mohammed Abdel Wahab Mohammed Hassan

List of Abbreviations

201T1	:	Thallium 201
ASA	:	American society of anesthesiology
CVP	:	Central venous pressure
DCM	:	Restrictive Cardiomyopathy
$ETCO_2$	:	end tidal carbone dioxide
HCM	:	Hyertrophic Cardiomyopathy
MI	:	Myocardial infarction
MR	:	Mitral regurgitation
MR	:	Tricuspial regurgitation
PA catheter	:	Pulmonary artery catheter
PCWP	:	Pulmonary artery capillary wedge pressure
RCM	:	Restrictive Cardiomyopathy
RVG	:	Radionuclide ventriculogram
TEE	:	Transesophageal Echocardiography
TR	:	Tricuspid regurgitation

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الملخص العربـــي

مرض وهن القلب يصيب عضلة القلب ذاتها دون أي أسباب واضحة، ويمكن تقسيم مرض القلب إلي ثلاثة أقسام رئيسية وهي وهن القلب التمددي، وهن القلب المتضخم، وهن القلب الضيق، وكذلك بالإضافة إلي أنواع أخري بمرض وهن القلب، كجزء من أمراض أخرى، مثل مرض ارتفاع ضغط الدم وقصور الشريان التاجي.

الظاهرة الرئيسية لمرض وهن القلب التمددي هو تمدد البطين مع فشل كفاءة ضخ الدم، والظاهرة الرئيسية لمرض وهن القلب المتضخم هو تضخم عضلة القلب نفسها، أما مرض وهن القلب الضيق فيحدث به عجز في أمتلاء البطنين بالدم مما تغيرات ديناميكية مشابهة لمرض التهاب الغشاء المبطن لعضلة القلب.

ويلزم لإجراء جراحة لمرضى اعتلال عضلة القلب تقدير كفاءة عمل القلب وذلك بالفحوصات المختلفة لمعرفة نوع المرض والتغيرات الديناميكية بالدورة الدموية التي تحدث للمريض.

وقد ثبت أن الأدوية المخدرة مثل الفنتانيل والسيوفنتانيل بديل جيد ومفضل علي العقاقير التخديرية المتطايرة حيث أن المخدرات تحافظ علي التغيرات الديناميكية للدورة الدموية للمريض عن طريق المحافظة علي انقباضية عضلة القلب.

أما بالنسبة لمرخيات العضلات المستخدمة فيجب أن يكون لها أقل تأثير علي التغيرات الديناميكية بالدورة الدموية للمريض علي سبيل المثال: روكرونيوم، فيكرونيوم، الأتريكيريوم. كم يفضل عمل تحليل لغازات الدم أثناء العملية وذلك

حتى يتثنى قياس نسبة ثاني أكسيد الكربون بالدم لتفادي حدوث نقص في نسبة الأكسجين أو زيادة بنسبة ثاني أكسيد الكربون.

كما يفض التخدير النصفي أو التخدير خارج الأم الجافية في مرضى وهن القلب التمددي أثناء جراحات البطن السفلي أو الطرفين السفليين ولكن مع أخذ كافة الاحتياطيات اللازمة لمتابعة ضغط الدم والنبض وضغوط امتلاء عضلات القلب اليمنى.

ومن الضروري مراقبة العمليات الحيوية والتغيرات الديناميكية بالدورة الدموية لمريض وهن القلب وذلك لتلافي حدوث أي مضاعفات وذلك فمن الضروري دخول مريض وهن القلب للرعاية المركزة فيما بعد إجراء الجراحة.

ومن أشهر هذه المضاعفات: اضطرابات ضربات القلب والتي قد تؤدي إلي الوفاة المفاجئة، وأيضاً فشل القلب المحتقن والجلطات القلبية وهبوط ضغط الدم.

Anesthetic Management of Cardiomyopathic Patients Undergoing Non-Cardiac Surgery

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Abstract

Cardiomyopathies are diverse group of disorders characterized by progressive, life threatening congestive heart failure.

Cardiomyopathy is a disease of the cardiac muscle of unknown etiology. It could be classified into three main pathophysiological categories: dilated, hypertrophic and restrictive cardiomyopathy. There are also other types as ischemic, valvular and hypertensive cardiomyopathy.

In dilated cardiomyopathy (DCM), the main feature is dilatation of the ventricle with pump failure**.**

In hypertrophic cardiomyopathy (HCM), the main feature is the increase in myocardial mass, but systolic functions are preserved.

In restrictive cardiomyopathy (RCM), there is restriction of filling of the ventricles by endocardial or myocardial disease or both giving a hemodynamic picture similar to restrictive pericarditis**.**

Preoperative evaluation of patient with cardiomyopathy by clinical examination and investigation must be done to detect the type of lesion and the heamodynamics.

Preoxygenation is important following preoperative sedation to avoid development of hypoxemia.

Narcotics such as fentanyl and sufentanyl are more preferred than inhalational anesthetic agents as narcotics provide more heamodynamically stability by preservation of myocardial contractility.

The muscle relaxant used must have minimal effect on hemodynamic state of the heart as rocuronium, doxacurium, vecuronium and atracurium. Pancuronium should be avoided in HCM but may be used in DCM**.**

Intraoperative controlled ventilation is used with attention to arterial blood gas analysis; end tidal CO_2 to avoid hypoventilation and consequent hypercarpia.

Regional anaesthesia is preferred in patients with dilated cardiomyopathy for lower abdominal or lower limb surgery but filling pressures,arterial blood pressure and heart rate should be carefully monitored. Spinal block is undesirable in patients with hypertrophic cardiomyopathy as it decreases both preload and afterload.

Careful monitoring of patient with cardiomyopathy must be done including non-invasive and invasive monitors to avoid intraoperative complications and to detect heamodynamic state.

ICU admission may be necessary postoperatively to treat complication. One of the most important post-operative complications is postoperative dysrhythmias and may cause sudden death**.** Other common complications could occur includes myocardial ischaemia, congestive heart failure, hypotension, hypothermia and systemic embolization.

Introduction

Cardiomyopathy are a diverse group of disease characterized by primary involvement of the myocardium ***(Irwin and Rippe,2006)***.

A variety of schemes have been proposed for classifying the cardiomyopathy.The most widely recognized one is the World Health organization(WHO).Cardiomyopathy is classified according to pathological features to three main types:Dilated, Hypertrophic,and Restrictive cardiomyopathy. ***(Irwin and Rippe,2006)***

These are other types of cardiomyopathy as ischaemic valvular and hypertensive cardiomyopathy. ***(Richardson et al.,1996)***.

For non cardiac surgery a careful preoperative assessment should be done to detect myocardial efficiency and heamodynamic state of the patient to make a suitable anesthetic plan. Preanesthetic medication as Benzodiazapines can be used to produce amnesia and minimize the pain associated with vascular canulation without producing cardiac depression ***(Wilson et al.,1998)***.

Supplemental oxygen is useful to avoid hypoxemia following to premedication ***(Morgan et al.,2006)***

Strict and careful monitoring of the patients should be done to monitor the heamodynamic changes introperatively. ***(Stanely and Newman,1994).***

Narcotic based technique is more preferred than volatile anesthetic drugs as narcotics preserve myocardial contractility.***(Stoelting and Dierdorf,2002)***.

Regional anesthesia can be used for lower abdominal and lower limbs surgery under strict precautions.***(Stoelting and Dierdorf 2002)***.

Patients with cardiomyopathy should be admitted to ICU postoperatively to avoid complications as congestive heart failure, cardiac dysrythmias, hypotension hypothermia and systemic embolization. ***(Weigelt,1996)***.

Cardiac Anatomy and Coronary Circulation

Gross anatomy of the heart

The heart is a hollow muscular organ of a somewhat conical form which lies between the lungs in the middle mediastinum and is enclosed in the pericardium. The heart consists of four chambers, right and left atria, and right and left ventricles ***(William et al., 1995).***

The division of the heart into four cavities is indicated on its surface by grooves. The atria are separated from the ventricles by the coronary sulcus (*auriculoventricular groove*) which contains the trunks of the nutrient vessels of the heart, and is deficient in front, where it is crossed by the root of the pulmonary artery. The interatrial groove, separating the two atria, is scarcely marked on the posterior surface, while anteriorly it is hidden by the pulmonary artery and aorta. The two ventricles are separated by two grooves, one of which is the anterior longitudinal sulcus which is situated on the sternocostal surface of the heart. Close to its left margin lies the other posterior longitudinal sulcus on the diaphragmatic surface near the right margin ***(William et al., 1995). Fig(1).***

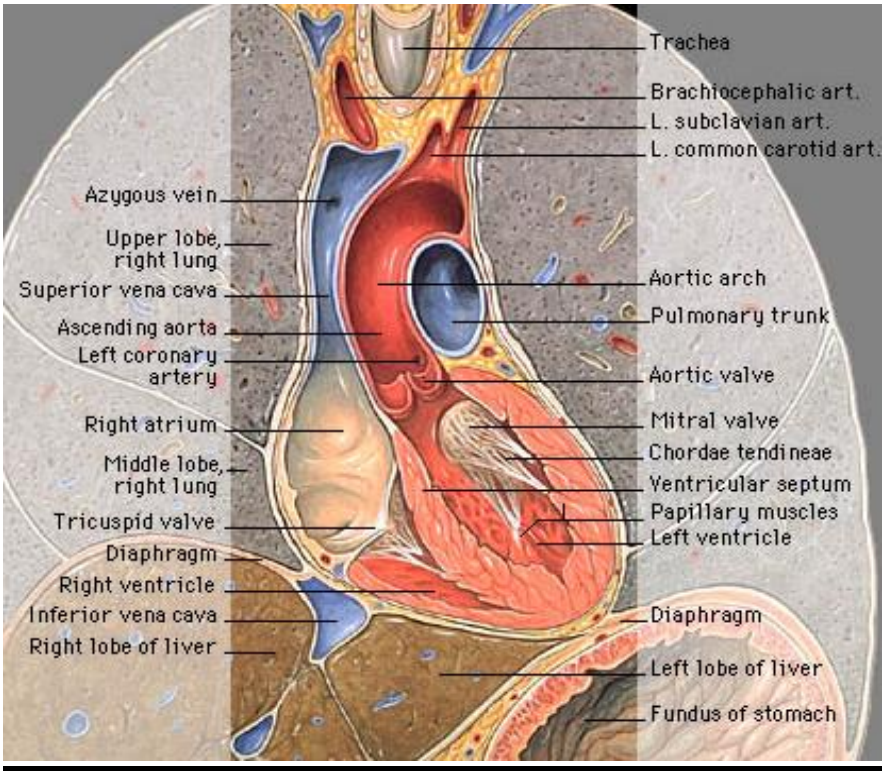

Fig. (1): The position of the heart ***(Jaffe and Patrick, 2004).***

Structure of the wall:

The heart consists of a layer of cardiac muscle (myocardium) covered externally with serous pericardium (epicardium) and lined internally with endocardium. Both enclosing layers consists of connective tissue covered with relatively frictionless endocardium. ***(Shah, 2005)***

The right atrium (RA):

Systemic veins drain into RA via superior vena cava,inferior vena cava &coronary sinus. The interatrial septum has a central indentation, the fossa ovalis, marked by a