ROLE OF VASODILATOR THERAPY IN HEART FAILURE

A REVIEW ARTICLE

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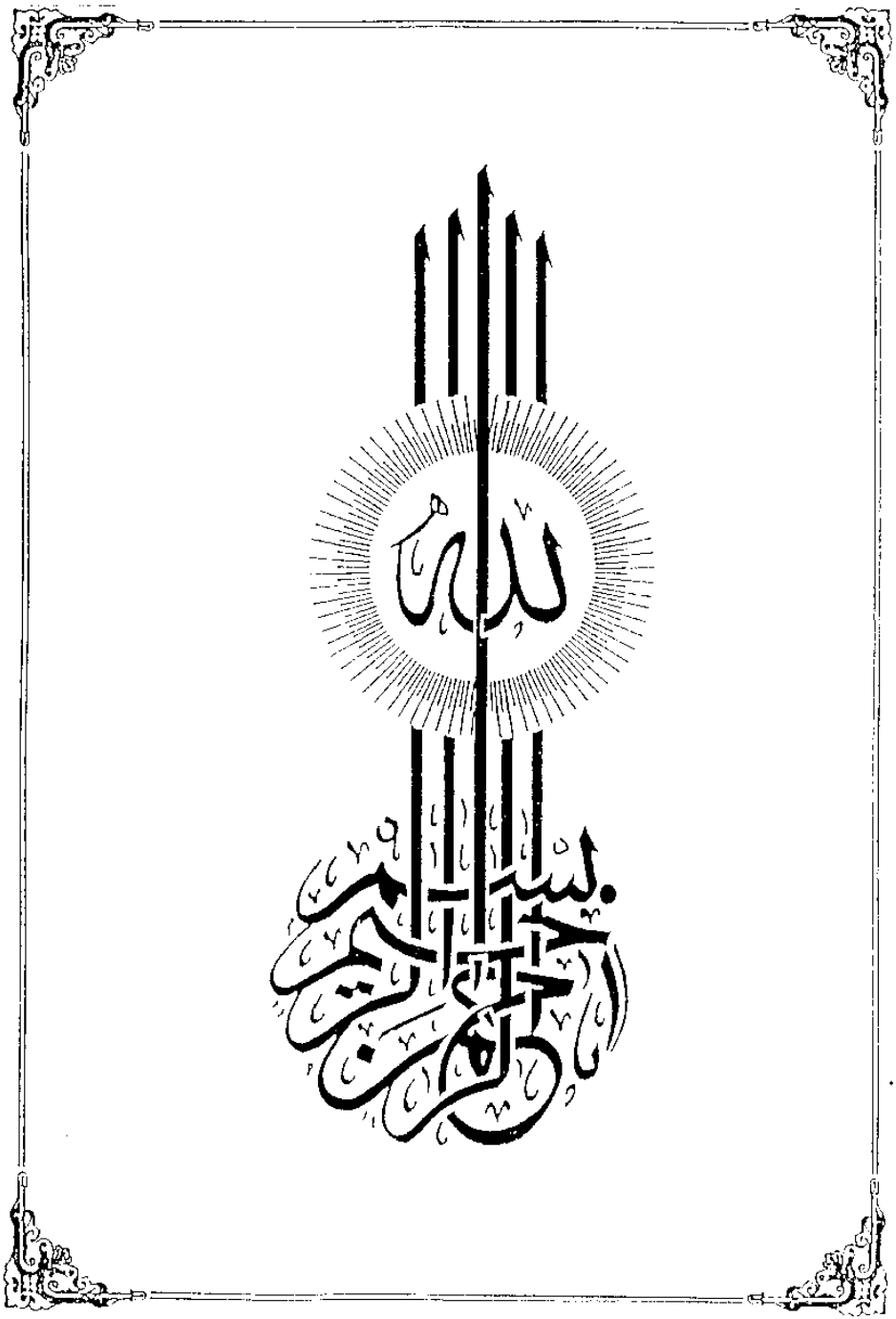

C O N T E N T S

INTRODUCTION

AND

AIM OF WORK

INTRODUCTION AND AIM OF WORK

This review article aims to study the role of vasodilator agents in heart failure .

Before studying these drugs, it was important to review the pathophysiology of heart failure, its causes and the routine treatment of heart failure .

No comprehensive review of these drugs is tried, but we stressed on the clinical point of view, that is the pharmacologic actions, undesirable effects, and clinical applications .

REVIEW OF LITERATURE

PATHOPHYSIOLOGY OF HEART FAILURE

Pathophysiology of Heart Failure

" If you wish to confer with me , define your term "

Voltaire .

Definitions :

The normal function of the heart is to eject the blood that is returned to it , and , in this sense , the heart is as much the servant of the circulation as its master[1] . Heart failure is that condition in which the heart is unable to pump adequate supply of blood to meet the metabolic needs of the body because of impaired myocardial performance (myocardial failure) or because of a mechanical defect that imposes an excessive work load, or quite often, a combination of myocardial and mechanical factors[2]. Heart failure should be distinguished from circulatory failure which means inadequacy of the cardiovascular system in performing its basic functions of providing nutrition to the cells of the body and removing metabolic products from the cells . It may be caused primarily by cardiac or non-cardiac conditions[3] .

Thus , myocardial failure , heart failure , and circulatory failure are not synonymous, but refer to progressively broader entities . Myocardial failure

always produces heart failure , but the converse is not necessarily the case , since a number of conditions in which the heart is suddenly overloaded as in acute aortic regurgitation secondary to acute infective endocarditis can produce heart failure in the presence of normal myocardial function[4]. Heart failure , in turn , always produces circulatory failure , but again the converse is not true , since a variety of noncardiac conditions e.g. hypovolemic shock , severe anemia,beri beri and other high output states can produce circulatory failure at a time when cardiac function is normal or mild impaired .

When abnormal circulatory congestion occurs as a result of heart failure , the term congestive heart failure is used. Congestion may be in pulmonary , systemic circulation or both , and must be of cardiac origin to validate the term congestive heart failure to distinguish it from circulatory congestion consequent to abnormal salt and water retention , but in which there is no disturbance of cardiac function per se[5]. Heart failure may be acute or chronic disorder . The latter is more common and , if untreated , is charcterized by congestion as well as by a low cardiac output .

Congestion may or may not be a feature of the former. The forward failure hypothesis relates the clinial manifestations of heart failure to the inadequate delivery of blood into the arterial system . According to this hypothesis , the principal clinical manifestations of heart failure result from reduced cardiac output , which results in diminshed perfusion of vital organs including brain leading to mental confusion ; skeletal muscles , leading to weakness ;and kidneys , leading to sodium and water retention through a series of complex mechanisms[6] .

The backward failure hypothesis indicates that when the ventricle fails to discharge its contents,blood accumlates and pressure rises in the atrium and in the venous system emptying into it . According to this hypothesis , the clinical manifestations of heart failure result from elevation of venous pressure behind the failing ventricle . Left sided heart failure and right sided heart failure are clinical terms used to refer to conditions in which the primary impairment is of the left side of the heart or of the right side of the heart, respectively . The most common cause of clinical right sided failure is left sided heart failure , since both

sides of the heart are in a circuit , the biochemical changes which occur in the opposite ventricle with the passage of time may play a significant role in causing failure of the other ventricle . Left sided failure is used in reference to symptoms and signs of elevated pressure and congestion in the pulmonary veins and capillaries , whereas right-sided heart failure is used in reference to symptoms and signs of elevated pressures and congestion in the systemic veins and capillaries[3].

In "low output failure" the cardiac output may actually be within normal limits at rest , although it may fail to rise normally during exertion , as in cases of failure secondary to coronary artery disease, hypertension , and valvular disease . On the other hand , in " high output failure " the output may be normal or higher than normal , but still it does not meet body's needs as in patient with failure secondary to hyperthyroidism , anemia , beri-beri , and arteriovenous fistula[7].

Compensated heart failure is that condition in which cardiac muscle function is depressed and the

heart and circulation utilize compensatory mechanisms, often with resultant symptoms , to prevent a fall in cardiac output to less than systemic requirements at rest[8]. Overt heart failure can be defined as the pathological state in which a severe abnormality of cardiac function results in inability of the heart to pump blood at a rate commensurate with the systemic requirements .

CAUSES OF HEART FAILURE

For the most part, conditions that lead to heart failure result from three classes or categories of disease. One category is related to mechanical abnormalities due to pressure overload on one or the other ventricle, such as aortic or pulmonary stenosis and systemic or pulmonary hypertension or due to volume overload on one or the other ventricle such as valvular regurgitation , and shunts (atrial septal defect , ventricular septal defect) or due to obstruction to ventricular filling (Mitral or tricuspid stenosis)[3] . A second category of conditions is that which alters the function of normal myocardium or leads to loss or replacement of normal myocardium (myocardial ischemia , scarring , infiltration of the myocardium , toxic insults , and primary or secondary cardiomyopathies) . A third category is related to abnormal cardiac rhythm (fibrillation , standstill, and extreme bradycardia or tachycardia) .

Precipitating Factors Of Heart Failure :

Cardiac disease, usually, remains compensated for long periods until some intercurrent factor precipitates heart failure . The major precipitating causes , as

distinguished from the basic cardiac diseases responsible for heart failure are infections , tachyarrhythmias , bradycardias , pulmonary embolism , excessive sodium intake , discontinuation of digitalis , myocardial infarction , haemorrhage and anemia , pregnancy and clild birth , transfusions and infusions , anesthesia and surgery , high altitude , corticosteroid or oestrogen therapy , and emotional stress[9].

Compensatory Mechanisms in Heart Failure

In the presence of a defect in myocardial contraction and or an excessive haemodynamic burden placed on the ventricle , the heart depends upon several compensatory mechanisms for maintenance of its pumping function : The increased release of catecholamines by adrenergic cardiac nerves and the adrenal medulla , which augment myocardial contractility ; the Frank-Starling mechanism , in which increased preload acts to sustain cardiac performance; and myocardial hypertrophy with or without cardiac chamber dilatation . Initially , these compensatory mechanisms may be adequate to maintain the pumping performance of the heart at a relatively normal level , although intrinsic myocardial contractility may be