

A PRIMER OF CONGESTIVE HEART FAILURE

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This is a discussion of one of the most important and most common disease states confronting man written for the medical student, the young graduate of medicine, and the general practitioner.

The concepts have been condensed to give the reader the present-day ideas of the mechanism and management of congestive heart failure.

American Lecture Series®



A Primer of
**CONGESTIVE
HEART FAILURE**

by

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DEDICATED

TO

VIVIAN GERARD BURCH

whose unstinted support and interest

have made my work possible

Preface

THIS lecture series on congestive heart failure, one of the most important and most common disease states confronting man, is primarily intended for the medical student, young graduate of medicine, and general practitioner. An attempt has been made to present the material to conform with the tradition of the American Lecture Series. The concepts have been condensed to give the reader the present-day ideas on the mechanism and management of congestive heart failure, no attempt having been made to cover every aspect of the subject. Because digitalis and mercurial diuretics are employed so extensively in this disease state, these drugs are discussed in separate chapters, with special emphasis on their practical use. It is hoped that these four chapters will arouse further interest in and assist in the understanding of the mechanism and management of congestive heart failure.

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G. E. B.

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A Primer of
CONGESTIVE HEART FAILURE

(CHAPTER ONE)

Mechanism of Congestive Heart Failure

INTRODUCTION

CONGESTIVE heart failure constitutes one of the enigmas in medicine today (1-7). Its mechanism was considered by most physiologists and clinicians to be clearly understood until recently (8), when the problem was re-investigated and found to be extremely complex and far from clarified. Reconsideration of the pathologic physiology of congestive heart failure has not only added much to our knowledge of cardiac function and hemodynamic states but has also reopened the field of electrolyte and water balance in normal man and in man afflicted with cardiac disease as well as other abnormal states. Renewed interest in disturbances of electrolyte and water balance in congestive heart failure has emphasized the complexity of this problem.

Interestingly enough, the important recent investigations into the mechanism of congestive heart failure have not modified materially, if at all, the procedures employed during the last 15 to 20 years in the management of the clinical syndrome. Nevertheless, because of the importance and frequency of occurrence of congestive heart failure in medicine, a brief discussion of certain aspects of its mechanism and management may be of value. Mercurial diuretics and

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digitalis will be briefly discussed separately, because these drugs enjoy significant roles in the care of patients with congestive heart failure.

DEFINITION

For purposes of orientation, these discussions, unless otherwise stated, are concerned with the clinical syndrome of *chronic congestive heart failure*. This is a syndrome which occurs frequently in man with cardiac disease and which has probably never been adequately produced in the experimental animal.

The syndrome, when fully developed in man, is characterized by dyspnea, generalized edema, which is most severe in the dependent portions of the body, generalized and symmetric venous hypertension, diffuse hepatomegaly, and possibly peritoneal or pleural transudates or both. Bilateral basal pulmonary râles, accentuated pulmonic second sound, pulsus alternans, gallop rhythm, orthopnea, weakness and many other manifestations may be present. Although there may be variations in details, all well known to clinicians, the general pattern is consistent (9, 10, 11).

Even though the presentation is concerned primarily with chronic congestive heart failure, the concepts may easily be extended to acute congestive failure and other special manifestations and variations of this disease.

ASPECTS OF THE MECHANISM OF CONGESTIVE HEART FAILURE

Since the mechanism of chronic congestive heart failure constitutes such a baffling problem, it is not possible to present in a brief discussion the entire scope of the pathologic physiology of congestive failure. Therefore, only certain

aspects will be presented to describe the problems encountered, in an attempt to clarify certain phases of thought and to indicate certain established facts and inconsistencies in interpretation. The numerous gaps in current knowledge will become evident from this discussion. Obviously, most of these concepts and data are not new, but it is likely that some of them have not been considered generally in this fashion. Although Starling clearly presented the problem over 50 years ago (12), little additional information of a fundamental nature has since been added. About 10 years ago Starr and Rawson (4) again lucidly presented certain basic aspects of the hemodynamic principles concerned with congestive heart failure, but these have been disregarded or forgotten by many. The concepts previously described by these investigators, as well as by others, will be reviewed in this presentation.

The complexity of the problem and inability to produce the syndrome in experimental animals have resulted in errors in research and thought, and progress has thus been slow. Most errors have occurred because of variations in the clinical state of the failure under study, inadequacies of the methods employed, complicating clinical states, complicating influences of associated therapeutic procedures, or because the sequelae of failure of the heart were being observed rather than actual failure of the pump itself. These and other factors have created difficulties in integration and comparison of observations, leading to considerable misunderstanding and confusion. Partially because of these factors, no major advance has been made toward solution of this problem.

The clinical manifestations observed at the bedside are mainly sequelae of cardiac disease or failure of the pump. Most observers investigating congestive heart failure have studied these sequelae rather than the heart or pump itself.

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This is understandable, since the pump cannot readily be studied, whereas some aspects of the sequelae are more easily approached.

DEFINITIONS OF CLASSICAL CONCEPTS

For purposes of orientation, the two classical concepts of congestive heart failure will be defined briefly:

(1) The backward failure concept (9, 10, 11). With failure of a ventricle to pump adequately, the blood returning to it accumulates proximally in the atrium and veins.

BACKWARD FAILURE CONCEPT

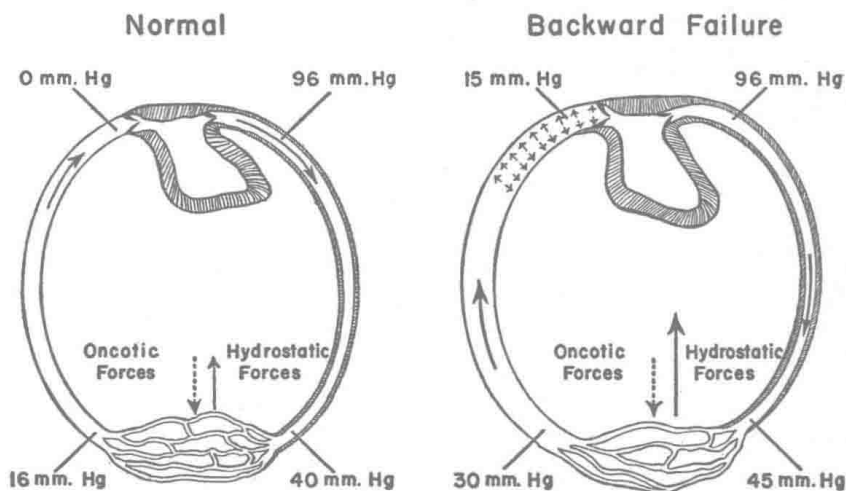


Figure 1. Diagrammatic representation of the classical concept of backward failure. The normal circulatory circuit is shown with normal mean pressures in the circuit and vectors of essentially equal magnitude indicating mean net effective oncotic and hydrostatic forces in the capillary bed. In the circulatory circuit with "backward failure" or congestion of blood proximal to the heart, there is an elevation in pressure in the venous system and a resultant increase in magnitude of the hydrostatic force, which tends to remove fluid from the vascular system at a greater rate than oncotic force, which returns the fluid to the circulation.

Because of this, edema develops.