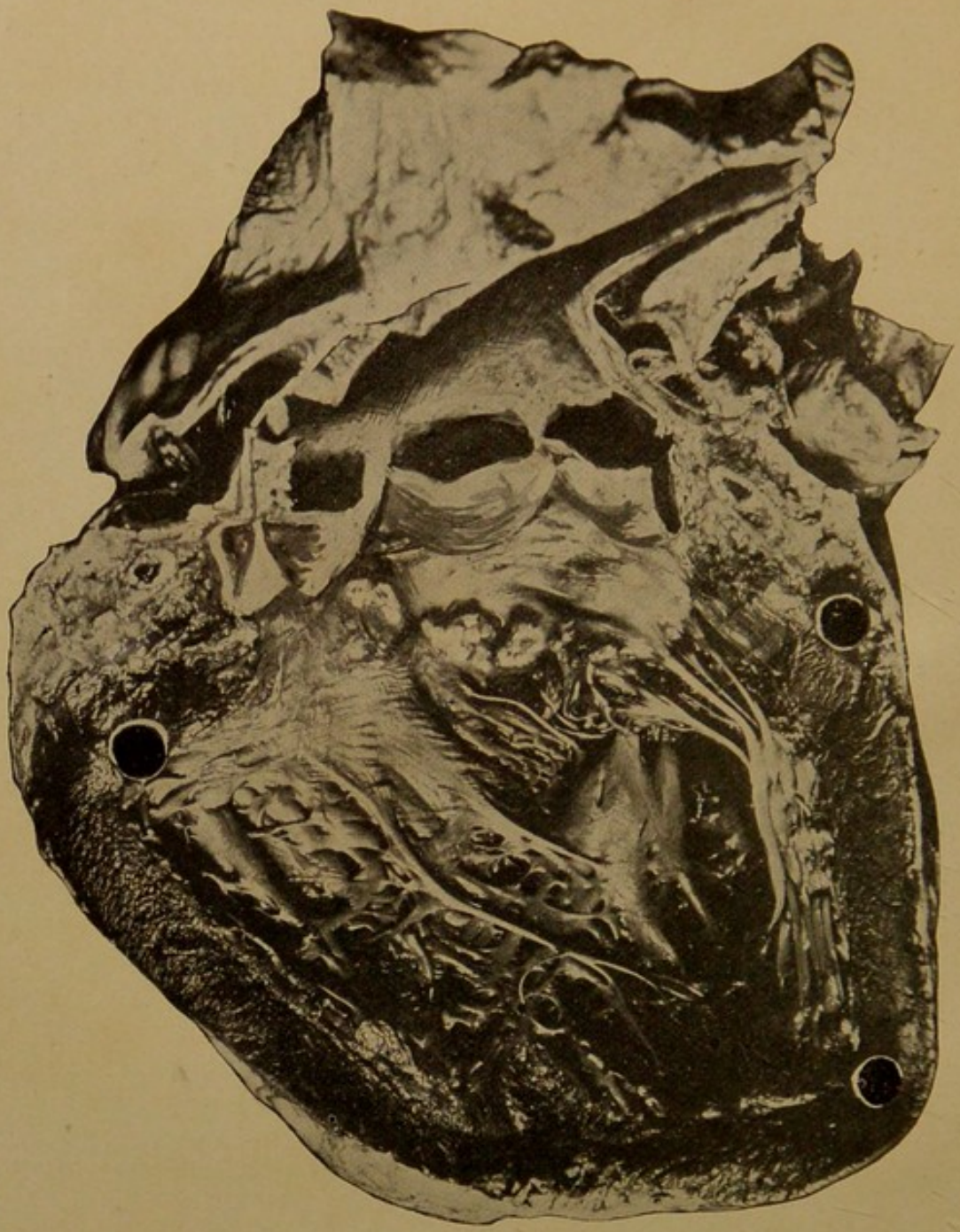
Heart disease, blood-pressure, and the Nauheim-Schott treatment / by Louis Faugeres Bishop.

HEART DISEASE BLOOD PRESSURE AND THE NAUHEIM-SCHOTT TREATMENT



Photograph of Heart in the Author's case of Adams-Stokes disease—showing Calcareous nodules (center of picture just below the aortic valves) in the region of the bundle of His. (See page 227.)

HEART DISEASE BLOOD-PRESSURE AND THE NAUHEIM-SCHOTT TREATMENT

BY

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THIRD EDITION

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PREFACE TO THIRD EDITION

THE exhaustion of the second edition has afforded the author an opportunity to publish, in a new edition, notes on the Schott treatment that he is making while at Nauheim, and to record his observations and conclusions of this treatment. This method has previously been brought to the notice of readers by American writers; notably by Dr. Schott's pupil Heineman, by Babcock, Peabody, Anders, Kinnicutt, S. S. Cohen, Futcher, Helmuth, Hutchinson and others. Whatever these notes may lack in scientific formality, it is hoped in a measure will be compensated by the freshness of the observations.

In the second edition, published in 1907, was inserted a chapter on "The Blood Vessel Tone-Maintaining Function of the Central Nervous System," and in the preface to this edition is the following remark: "In a chapter on 'The Vessel Tone-Maintaining Function of the Central Nervous System,' will be

found a physiological doctrine which does not appear in the literature of the day, but which would seem the key to the explanation of a large number of cases. Reading with this theory in mind, it has often seemed that an author must have had the idea in view, but not quite clearly enough to state it."

Before leaving America the book of Professor William Russell, of Edinburgh, pertaining to this topic, came to hand and was read in part. Dr. Russell has supplied a discussion of the importance of the median coat of the blood vessels that had not previously been elaborated.

As to matters of fact, concerning Nauheim, all sources have been drawn upon freely, but in regard to theory no one is to be held responsible, except the author himself, who wishes here to express his high appreciation of the extreme courtesy and kindness of Dr. Schott and the Drs. Groedel, who have made his stay at Nauheim of extraordinary interest and profit.

L. F. B.

Bad-Nauheim, Germany,
Hotel Kaiserhof,
July, 1908.

PREFACE TO SECOND EDITION

During the four years that have elapsed since the first edition of this book was written a wide interest in the subject has developed, and the concentration of the work of the author on the heart and circulation as a specialty has resulted in certain further conclusions which he is anxious to submit to the judgment of those who received so kindly the first edition. In a chapter on "The Vessel Tone-Maintaining Function of the Central Nervous System" will be found a physiological doctrine which does not appear in the literature of the day but which would seem the key to the explanation of a large number of cases. Reading with this theory in mind, it has often seemed that an author must have had the idea in view but not quite clearly enough to state it. The chapter on "Hypertonia Vasorum

Idiopathica" is a discussion of the clinical application of the theory to an important class of cases. The title of the book has been slightly changed, because it was found that "Blood-Pressure" alone conveyed the idea only of laboratory physiology, while in fact the book was taken up with the consideration of cases that are popularly called "heart disease."

The author has been much gratified by the attention given to his classification of disorders of blood-pressure and by the frequent reference by writers on blood-pressure to the condition described by him in a paper reprinted on pages 95-98 describing "Constitutional Low Arterial Tension." L. F. B.

No. 54 West 55th Street,
New York,
1907.

PREFACE

THE publication of a treatise on blood-pressure at a time when so much has been learned, and so many books are appearing on the subject, demands a note of explanation.

My excuse is that for the past fifteen years, indeed, ever since as an hospital interne I first came in contact with patients suffering from serious disease in which the circulation was involved, the question of the vital relations of the physics of the circulation has been one of the most interesting problems that has constantly presented itself in the domain of clinical medicine. During this time the care of patients suffering from those diseases and conditions in which the fight for life was a contest with progressive circulatory failure, has formed a serious part of my work.

It is a fact that is constantly appearing in the literature of the day, that circulatory dis-

ease, as represented in statistics of disease of the heart and disease of the kidneys, is relatively more frequent than formerly. It is undoubtedly true that under the strain of modern life, many other causes of disease having been eliminated, disorders of the circulation dependent upon altered blood-pressure have become very important.

Just as tuberculosis has for its victims the most attractive of the youth of the land, so high arterial tension claims the best and most successful of those past middle life who have borne the weight of the strenuous demands of a modern career. Much attention is now being directed to tuberculosis because its cause and progress have become a matter of public knowledge. The victims of circulatory disease, however, still too often go for months and years without intelligent treatment because no one has pointed out to them the danger signals and the signboards which point to the destruction to which they are tending.

Admirable as is the work of the rescue of the young, who may or may not become citizens of marked usefulness, how much more important to the community is it if some years can be added to the career of the mature and trained worker.

The subject of the mechanical measurement of the actual pressure in the vessels has not been considered at length, as that is so well discussed in other works, and it was here wished to emphasize the clinical relations of blood-pressure as interpreted in the light of clinical experience. There is an over-respect in these days for so-called *scientific work*, wrongly limiting the term to that which is in some way connected with a laboratory and apparatus. This is a narrowness of recent times. There are many sciences besides mathematics, experimental biology, and chemistry, and if clinical workers yield the field of medicine entirely to the so-called research workers and the laboratory men, there is certain to be a

halt in the progress of the art of medicine as it bears upon the wise management of the individual during the course of his life.

These are the reasons for the publication of the conclusions which are the result of clinical work upon a subject which is being well considered from a mechanical and laboratory point of view. L. F. B.

New York, 1904.

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CHAPTER I

ALTERATIONS OF PRESSURE IN THE BLOOD-VESSELS

PRESUPPOSING a knowledge on the part of the reader of the systematized facts concerning disease of the heart and blood-vessels, and some actual experience in the treatment and care of patients, we approach the subject of disorders of the circulation from the viewpoint of the consulting room and the hospital ward, rather than from that of the library, the pathologic laboratory, and the classroom.

We find immediately that we have to deal for the most part with slowly developing or long-established conditions. The study of acute disease is of great importance, particularly to the beginner in practice who desires to hang an item of experience upon each peg of recently acquired knowledge, but in actual

practice, on the principle of the greatest good to the greatest number, the attentive study of chronic disease is at least equally necessary.

Alteration of pressure of the blood in the vessels constitutes the most striking disorder of the general circulation, and upon a study of its causes, effects, and control, will be built this entire consideration of the subject. Indeed, the whole mechanism of the circulation has to do with the maintenance of high-pressure or low-pressure in one part or another of the vascular system as may be demanded.

It is easy to see that the maintenance of the circulation is not a question of the degree of tension in any part of the circulatory system, but of a proper relation in tension between pressure in the arteries, where the blood is stored, and the points at which it is needed. It is usual, however, to study the question from the standpoint of the arteries. In most cases it is only late in circulatory disease that venous pressure becomes of importance. The freedom of passage between the arteries and veins through the arterioles and capillaries is of extreme importance.

In health the physiologic relations of blood-pressure are instructive. The effect of muscular exercise on blood-pressure is at first to raise arterial pressure, but finally after the exercise has been continued for some time, the pressure falls again to normal. The same is true in regard to the effect of mental effort.

During the existence of this increase of arterial pressure due to exercise, there is a large amount of blood in the arteries. This is obtained from the large veins in the abdomen, which act as a source of supply from which, in health, blood can be drawn to flush any part of the arterial system. This tide of blood between the digestive organs and the systemic area is illustrated in many ways. Thus, the coldness after eating indicates that the tide has set toward the digestive organs. The indigestion following exercise after eating, and even more markedly the indigestion following strong emotion after a meal, shows that the tide has set the other way. The lethargy and mental inactivity of those who habitually overeat, and the tendency to indigestion of mental workers, indicate the same thing. The relation between

the circulation in the abdomen and the circulation in the brain is an intimate one. The proverbially good mental condition in patients suffering from acute peritonitis may very well be due to the spasm of all the abdominal muscles that prevents the accumulation of large quantities of blood in this part of the body.

The impression of the circulation obtained by one's early study of physiology is erroneous. It resembles too closely the idea of a series of closed pipes, as in the plumbing of a house, the water entering at a large pipe, going through a system of smaller pipes, and after having been used in certain fairly definite receptacles to be collected by a similar set of pipes which convey it to a common outlet. Of course, in a house the circle is not complete, as the water does not again re-enter. In general, however, that is the conception of the arrangement that is obtained by the average teaching of physiology.

The facts, however, are very different in the human body. The arterial system is really a reservoir of blood in which the area of a cross

section of the combined vessels very rapidly increases from the heart outward. In this series of passages the blood is contained and held under pressure by a muscular envelope. From this reservoir the blood escapes for use, through the arterioles and capillaries, and the office of the heart is to pump into this reservoir sufficient blood to maintain the pressure depleted by the blood used by the capillaries. This naturally creates a flow of blood from the heart toward the periphery, but the immediate use of the heart is to maintain this arterial pressure.

This is well shown by the fact that the actual amount of blood propelled by the heart varies greatly, according to the demand for fresh blood on the part of the body. During exercise, when the peripheral vessels are open, and there is a drain on the arterial system, the heart works harder to supply the deficiency. Thus the arrangement and movement of blood in the body are seen to be more like a system of irrigation than of circulation, there being a reservoir with numerous branches from which the irrigating fluid is distributed, and a system

of conduits by which it is collected to be again transferred to the storage place.

The idea of the office of the veins as a storehouse of blood is a very old one, and one which has had much influence upon therapeutics. The consideration of the arterial system as a similar reservoir in which suitable pressure is maintained by the muscular elements which go to make it up, seems to have been overlooked. The truth of the fact that the arteries form a reservoir rather than mere conduits is shown by the fact that blood pressure is practically uniform throughout the arterial system. This means that the blood moves with the utmost freedom throughout the arteries, and that the movement of the blood is controlled, not by pressure from behind, but by the escape of blood from in front.

The arterial system is thus like a reservoir analogous to the tubular boiler of some types of engines. It is a hollow ramifying organ containing a vital fluid, the capillaries being the ducts. Whenever there is a demand for this vital fluid in any part of the system, the muscular covering of the organ contracts, the

arterioles which lead to the proper capillaries dilate, and the demand is supplied. The demand upon this organ for the vital fluid is so great that a special mechanism, represented by the heart, conducts the vital fluid from the places where it is manufactured, and the lungs where it is purified, to the high-pressure receptacle from which it is used.

This conception of the arterial system as a high-pressure receptacle for the blood, is well borne out by a study of the evolution of the circulation in the lower forms of life, where there are first found small interstices in the tissues through which the blood ebbs and flows in an irregular manner. As we ascend the scale the blood is found in more definite receptacles until finally we reach the complex arrangement found in man.

The action of the vascular system is, on a large scale, not different in principle from that of a secretory gland adapted to the unusual demand for its contained fluid.

The so-called circulation of the blood was discovered very late in the history of man, and students have become so fascinated with the

mechanical beauty of the whole arrangement that they have allowed the mechanical idea to outweigh the realization of a living organism. It is the old truth of the pendulum which has swung too far when once started by Harvey. We need to return a little to the earlier conception, which considered more the function of the blood in particular parts of the body than its circulation.

In all studies of blood-pressure it must be remembered that the blood is subject to the laws of hydrostatics, and that the force of gravity must be discounted.

There are two great groups of cases which may well be called low-pressure cases and high-pressure cases, and a third group of secondary low-pressure in which there has been a preceding high-pressure.

The low-pressure cases are all those in which inflammation or degeneration of the heart muscle itself, its envelopes or its valves, has primarily interfered with the blood-propelling function of the heart.

The high-pressure cases are all those in which disorder of the arterioles, due to toxemia or

other causes, have brought about an unreasonable demand on the part of the system for a high-pressure in the arterial reservoir to determine the proper supply of blood to the organs.

It is particularly important from the point of view of practical physicians to distinguish between the two great groups of circulatory disease, both in their early and in their late development, because there is an essential difference in their management.

Low blood pressure as a terminal stage of high blood pressure, must, of course, be considered in the light of its development, but is of so great importance that we have studied it by itself.

CHAPTER II

PRIMARY LOW-PRESSURE CASES

Disorders of the general circulation are generally first recognized when some particular portion of the body becomes the seat of a marked congestion or anemia. It is under these circumstances that symptoms arise.

Anemia and congestion often produce symptoms that are strikingly similar. Delirium may be the result of congestion of the brain, but it may likewise result from anemia. Dyspnea may be an accompaniment of congestion of the lungs, but a deficient blood supply is its most common cause. Acute congestion of the kidneys causes suppression of urine, while diminished blood supply causes deficiency of secretion.

The effect upon an organ is a matter of the proper supply of fresh blood, not merely of a greater or less amount of blood being in the

vessels of the organ. This explains beautifully the effect of local therapeutics, such as the removal of a small quantity of blood, or the institution of some form of counter-irritation, the result of which is to start a stagnant local circulation. There is, however, little gain from the treatment of local congestion or anemia without attention to the general circulation in cases where the cause is general. Hence the extreme importance of recognizing which cases are of purely local origin, and which have their origin from the general circulation.

In this study of the circulation we will not include an extensive consideration of the inflammatory diseases of the heart, but will concentrate our attention upon those conditions which we are most often called upon to treat, and leave to the more comprehensive treatises the systematic consideration of the morphology of heart lesions and the discussion of physical signs.

During the acute stage of valvular disease, in the large majority of cases, circulatory failure does not become a matter of special anxiety. Low blood pressure usually shows itself

when the patient resumes his ordinary occupation.

The symptoms are practically the same for all forms of valvular lesions, although different in degree. Indeed, it is sometimes more an academic than a practical question to decide which valves are at fault. Much more important is the question whether the defect has been properly compensated, and whether this compensation can be maintained. In general, however, it may be considered that in aortic disease the defective circulation is more strikingly due to an insufficient supply of blood in the arteries, and in mitral disease to an increased pressure in the veins, both resulting in a diminution of the difference in pressure in the arteries and veins, upon which the proper passage of the blood through the tissues depends.

The belief, so firmly held by many, that cardiac disease is usually confined to the left side of the heart is not borne out in practice. The most serious and fatal disorders involve the right side of the heart. This belief that the left side of the heart was almost the sole suf-

ferer from heart disease, was founded upon an old pathology which regarded chiefly the valvular deformities.

It is true that inflammation and distortion of the valves is almost entirely confined to the left side of the heart, but it is likewise true that both sides suffer equally in the incompetencies of the valves that come from strain or weakness of the heart-muscle as seen in very many cases of disorder of the circulation.

The left side of the heart can be markedly deficient in mechanical detail or physical structure, and the patient may get along fairly well until dilatation involving the right side of the heart takes place, with tricuspid regurgitation and its resulting venous engorgement.

It is necessary to remember that low blood pressure is only to be regarded as pathologic when it is so little above venous pressure that the tissues and organs are not properly supplied with blood. There are instances where the heart is perfectly able and willing to produce more arterial pressure, but the peripheral circulation is so relaxed that it is not needed.

We get true low-pressure cases when

the pressure-producing mechanism has failed. These are primary when there has not been a previous over-demand for pressure.

Low blood-pressure due to general prostration is not to be regarded as a disorder of the circulation except in so far as the circulation fails to respond to demands made upon it. Thus in shock it is the nervous system that is at fault, not the circulatory apparatus.

CHAPTER III

THE MANAGEMENT OF PRIMARY LOW-PRESSURE CASES

The indications for treatment in disorder of the circulation characterized by deficiency in pressure in the blood-vessels which is primary in that it has not been preceded by high arterial tension, are simple, though the elaboration of the management of each case will tax the judgment and ingenuity of the physician.

When there is no defect in the valves and no tendency to obstruction in the arteries, the condition is usually a weakness of the heart, and much may be accomplished by iron, arsenic, and hypernutrition, by increasing the number of meals, and by outdoor exercise.

When low-pressure is due to valvular disease we must consider the care of the heart before the establishment of complete compensation, during compensation, and in cases of broken compensation.

In the early days of a newly acquired valvular lesion, prolonged rest in bed with the very gradual resumption of a more active life, will enable both the heart and the body in general to adapt themselves to the new conditions. Of necessity there must be a compensatory hypertrophy, but it is not to the advantage of the patient that the hypertrophy be excessive, hence the desirability of such gradual resumption of active work. Until subjective symptoms and objective signs of defective circulation have disappeared, the patient must be restricted to a very quiet existence.

The use of drugs at this time is usually inadvisable, yet in cases of long-delayed compensation digitalis may be used.

When compensation is established and proper pressure in the arteries maintained, these cases may still be classed in the category of low blood pressure because of their tendency to this condition, just as we consider cases of Bright's disease as being high-pressure cases even when the condition is not actually present at the time.

During the stage of compensation, which

may be of long duration, the patient should lead a well-regulated existence—physical over-exertion, mental over-anxiety, and dissipation of all kinds must be avoided. Not only is a quiet life necessary when conscious symptoms are being caused, but also on account of the tendency, without conscious symptoms, to the production of excessive hypertrophy, leading in the end to degeneration. The occasional use, during the stage of compensation, of the iodid of soda as a means of preventing degeneration of the hypertrophied heart, is a useful procedure even when no other drug therapy seems advisable.

The treatment of low-tension resulting from ruptured compensation in a valvular case free from the taint of arterial resistance, often consists principally in rest in bed with particular care of the alimentary canal, no drugs being used at all. If the attack be more severe, with congestion of the kidneys and edema of the extremities, digitalis should be used for a time.

It is interesting to note that when a system of treatment has proved applicable to a particular form of disease, very soon its application

becomes extended to other diseases. The cure of tuberculosis is acknowedged to be a matter of the re-establishment of certain forces in the physical economy, the breaking down of which renders the patient susceptible to the disease.

In the progress of cardiac disease there are many elements that are not unlike the advance of tuberculosis. The term "cardiac cachexia" has been applied to a form of this condition accompanied by congestion, but it might well be extended to include the deterioration of fiber which leads to failure of the circulatory apparatus. In tuberculosis the connection between the cachexia and the disease is so evident that its hygienic management needs no advocate. It is equally true that the progress of circulatory disease is often dependent upon nutritional causes, and that the hygiene of tuberculosis in its demand for fresh air is equally important to the cardiac patient.

The vitalizing effect of fresh air in these cases will more than counterbalance the dangers of catching cold, although care is necessary when inflammation or congestion of the

kidneys is present. The patient can be trained to sleep with open windows.

Concerning warm bathing, it seems to be a fact that there is much less danger of taking cold than was formerly supposed. This fear is a tradition handed down from an age when bathtubs were more of a curiosity than they are in modern times. Our ancestors considered the taking of a hot bath before going out, a serious risk. Now, this is something that is done by thousands of people every day without bad results. It seems that the risk of exposing the body to changes of temperature after the bath rapidly diminishes when the patient has become accustomed to regular bathing.

Low-pressure due to degeneration of the heart-muscle which has not been preceded by hypertrophy is not at all common except in connection with acute or chronic general disease. The treatment in these cases is that of the general disease. But little is accomplished by measures directly influencing the circulation. The same is true of the heart overloaded with fat. Treatment must be hygienic, though the defective heart-muscle demands special precautions.

CHAPTER IV

HIGH-PRESSURE CASES

By high-pressure cases in contradistinction to low-pressure cases are meant all those circulatory disorders which are characterized by undue resistance in the circulatory path of the blood. It is not necessary, for cases to be classed in this category, that actual high-pressure should always be present in the blood-vessels. It is enough that there is a tendency toward the necessity for abnormal high-pressure for the proper circulation of the blood.

High-pressure cases comprise all instances in which degenerative disease of the blood-vessels or kidneys, or toxemia causing disordered action of the same, and resulting in high arterial tension, precedes or goes hand in hand with the development of cardiac disease.

Low-pressure cases occasionally become high-pressure cases, as when valvular disease

of the heart causes secondary Bright's disease. High-pressure cases, however, are not converted into low-pressure cases, as a sharp distinction must be drawn between primary and secondary low pressure.

The management of high-pressure cases, which includes a large proportion of the slowly developed diseases incident to the overwork and luxury of modern times, is relatively more important than that of the low-pressure cases. It is particularly important to detect the earliest development of a tendency to high arterial tension because at this time it is more amenable to treatment.

Disorder of the general circulation is the great factor which has to do with the limitation of life in all persons who escape those causes of death which are more or less accidental, so when local disease is eliminated, duration of life depends upon the integrity of the heart and blood-vessels.

As implied above, in this class of cases the heart, blood-vessels and kidneys go hand in hand, and serious disease of one is not found without involvement of the others. Hence the

term "chronic Bright's disease" is frequently used in speaking of these cases. The fact that this law of the co-relation of the heart, blood-vessels and kidneys has been overlooked in the past, has led to much misconception, not only as to disease of the kidneys, but also disease of the blood-vessels and heart. When they are studied together it is found that often the earliest indication of disease of the one is found in disorder of the other. Chronic Bright's disease is not essentially a disease of the kidneys, although in the final catastrophe these organs are often chiefly at fault. Primarily it is a disease of the circulation in which the brain and kidneys, acting as it were as end-organs, first manifest symptoms.

A case which had been under observation for five years ended fatally by the involvement of the circulation of the brain, producing progressive stupor and finally coma, paralysis, and death. The kidneys at the time were apparently in good enough condition to have functionated fairly well for a much longer time. In this case the greatest care had been exercised in protecting the kidneys by diet, an

even temperature, and every other possible means, thus allowing the arterial disease an opportunity for its complete development. The same case, if less carefully guarded, would have progressed by repeated attacks of uremia, to a death by the development of anasarca and exhaustion. We have, then, the paradox that a person may die from Bright's disease with fairly good kidneys, this case illustrating the fact that the brain and the kidneys are both end-organs, and that in particular cases the brain may suffer more than the kidneys.

This point is important in considering the early symptoms in high-pressure cases. The kidneys are insensitive organs, rarely giving rise to pain, intermittent in their manifestations, and entirely removed from direct observation; for this reason disorder of the kidneys may reach a grave stage before it becomes a matter of consciousness. On the other hand, the brain, as the seat of consciousness, is highly sensitive to any interference with its functions. To a certain extent it is also capable of examination through the observation of the fundus of the eye, which is in

close relationship to the brain. It may be stated that the brain records at all times, in a more or less distinct manner, the condition of the circulation, and a careful study of the symptom-complex soon reveals which disturbances of the circulation indicate organic disease of the vessels and early Bright's disease. Attention and observation soon make this symptom-complex of extreme significance.

Even in cases in which chronic Bright's disease follows acute nephritis, the establishment of the chronic condition is characterized by certain detectable vascular changes. In cases of acute nephritis one watches the circulatory system with anxiety, because, when changes are established, the chance of complete recovery is diminished. In acute Bright's disease the heart is temporarily debilitated so that there is often established a blowing systolic murmur at the apex, and the profound anemia and nervous phenomena that accompany the disease may lead to other functional disturbances of the circulation. These must, however, be distinguished from the changes that take place in

the arteries which indicate the transition from subacute nephritis to the chronic general condition. The same change sometimes indicates the establishment of a chronic nephritis in cases of valvular disease of the heart that have been accompanied by prolonged congestion of the kidneys.

Though it is hardly to be supposed that cardiac hypertrophy can be established except by some cause acting for a considerable period of time, still it is often the earliest detectable sign of chronic nephritis. Abnormal arterial tension may for the moment be absent, either on account of treatment or for some other cause, but when physical examination shows distinct cardiac hypertrophy we suspect at once a high-pressure case of circulatory disease.

It is probable that an increased flow of urine found in early Bright's disease is due as much to increased blood-pressure as to any definite change in the kidneys. Loomis speaks of an increased frequency of urination as an early sign of Bright's disease, and this again may well be accounted for by increased secretion due to increased arterial tension.

Nose-bleed is another possible result of increased arterial tension, and may, therefore, indicate the beginning of Bright's disease. Another accompaniment of increased arterial tension is headache, due apparently to increased vascular tension in the head.

I would also like to class as one of the early disturbances of high-pressure cases, certain attacks of indigestion. These are due at this early stage to disturbances of circulation in the stomach, and are not to be confounded with uremic nausea.

High-pressure cases more often develop in an atypical than in a typical way, and even in their final fatal course may never present the symptoms that one would expect. The early symptoms are often an unhealthy look, loss of strength, and such disturbances of digestion as may be referred to simple weakness. The urine may only contain albumin at rare intervals, so that it would not be detected by anything save systematic observation.

It is fair to say that the early signs of impending changes in the blood-vessels also mean the early circulatory changes of Bright's

disease. The first signs of degeneration are manifested by disorder of function. The blood-vessels act as tubes to convey the blood to different parts of the body, but at the same time, through the muscular structure of their walls, they act as regulators of blood-pressure. This pressure-regulating function is an exceedingly complex one and controls the determination of blood to the different parts of the body as it may be most needed. It is this regulating function which first suffers when the tendency to high-pressure begins to show itself, so that irregularity of tension is the most important early circulatory indication.

We have traced those signs and symptoms in the circulation which precede, for a long time, the establishment of that condition known as chronic Bright's disease. The smaller arteries are attacked earliest, and these are the first to show disordered function. Increased arterial tension, or a tendency to it, causes irregularity of blood-pressure, and is early recognized by symptoms indicating irregularities of circulation in particular parts of the brain. This irregularity may give rise to tem-

porary unconsciousness, slight paralysis, or simply to clumsiness of a limb.

The typical high-pressure case as met with in practical work, is usually one which has gone on to its full development without observation or treatment. The patient presents himself because he has symptoms, or because on some occasion an examination has revealed the chemical or physical signs of the condition. The heart is found hypertrophied, the arterial tension high, and the urine increased. Careful questioning will elicit symptoms of disorder of the cerebral circulation as indicated by a subjective feeling of nervousness, headache, insomnia, or attacks of dizziness, or even threatened aphasia, and hemiplegia. The hypertrophied heart is compensatory, having been hypertrophied in order to meet the demand for high blood pressure, just as the heart in valvular disease is hypertrophied to meet the demand for normal arterial tension when it is working at a disadvantage.

So long as the blood pressure is maintained, the patient is not in danger in the direction of the circulation, but is, of course, liable to ac-

cidents due to injuries to the nervous system, or a sudden failure on the part of the kidneys. The circulatory danger arises from the exhausting condition under which it is carried on and the inevitable approach of the time when the tension can no longer be maintained, hence the vital importance of seeking out and relieving the underlying cause of this high arterial tension, and the futility, except as a temporary expedient, of treating the symptom itself as the primary disease by the prolonged administration of vaso-dilators.

CHAPTER V

THE MANAGEMENT OF HIGH-PRESSURE CASES

THE management of high-pressure cases is perhaps the most important topic of our whole subject, as it is also the one in which the greatest advance has been made in the knowledge of circulatory disorders.

The causes of high-pressure are all those circumstances which occasion a long-continued demand for hyperactivity of the circulation, also those conditions which interfere with the proper carrying out of the chemical operations in the body, whereby there remain in the circulation incomplete chemical products. The same chemical cause may arise in a different manner through an interruption of the work of the kidneys whereby toxic substances are retained in the blood. The latter two causes fall under the head of gout and Bright's disease. Certain toxins, as for instance those of the infectious diseases, probably only cause

high-pressure cases through primary damage to the kidneys, heart and blood vessels.

The first principle of all treatment must be the removal, as far as possible, of the causes of the condition, hence the management of high-pressure cases must begin by the discovery and removal of the influence which has led to their development. Thus, a man who is intemperate with regard to alcohol must be cautioned against its use; the man who has assumed an unusual burden of responsibility in life must readjust his plans so as to lead a life free from anxiety and excitement. The patient who has habitually been addicted to the over-ingestion of food must be restricted as to his diet. The patient with damaged kidneys must be subjected to a regimen which will enable these organs to do their work properly.

A mistake that is often made is in treating these cases all alike and regarding them as primarily disease of the kidney. For instance, a patient with kidneys damaged by disease may often use alcohol in moderation with therapeutic benefit; the patient whose condition is secondary to mental strain may often be bene-

fited by the ingestion of food, and by a luxurious mode of life which is entirely contraindicated in the patient whose condition is that of the so-called gouty diathesis, or, as we have expressed it, secondary to the breaking down of the chemical functions of the body. So no hard-and-fast rules can be laid down for the management of high-pressure without regard to its origin. The influence of drugs is also a matter depending upon the nature of each case.

The distinction which we have drawn between high-pressure cases and low-pressure cases presents an immense advantage in the power of discrimination between therapeutic measures. Particularly is this true in regard to hydrotherapy.

The general statement may be made that warm bathing is indicated in high-pressure cases, and cold bathing only in primary low-pressure cases—with this distinction, however, that cold bathing is contraindicated in high-pressure cases, while warm bathing, and even hot baths, may be beneficial, and often are in low-pressure cases.

These facts are nowhere better illustrated than in the two great modern applications of hydrotherapy—the Nauheim and Brandt systems. In the former we are dealing with high-pressure cases, though frequently, indeed, in the stage of secondary low pressure. In the latter we are dealing with the primary low arterial tension of acute disease.

The beneficial effect of systematic warm bathing, preferably with the addition of salines, whether combined or not with resistance exercises, in high-pressure cases with a tendency to cardiac dilatation, is very striking. Equally striking is the injury observed from a persistence in taking cold baths by elderly people at the present time who fell under the influence of certain popular doctrines years ago, which entailed a Spartan regimen including cold baths and coarse food.

The Nauheim treatment is particularly applicable to this form of disease, no matter what its origin, and its great success, though supposed to be due to a direct action upon the heart, is really due to the correction of disorder of the arterial system, particularly in

cases in which there is a commencing secondary low blood pressure.

The baths are essentially tepid baths with the addition of saline ingredients which have an action upon the peripheral circulation.

The growth of this treatment, met as it has been at first with surprised incredulity, and later with blind faith, is now being analytically studied and is found to be applicable to many patients in many places without much complication of detail.

The characteristic Nauheim treatment as recommended by Schott is not really a very warm bath. It is never given above 95°, and even as low as 88° F. The presence of carbonic acid and the salines causes a distinct impression upon the skin.

The Schott treatment, therefore, must not be confounded with the valuable procedure of ordinary hot bathing in persons who have feeble circulation. The former procedure might be accompanied by certain dangers in persons with defective kidneys, while ordinary hot bathing with perhaps the addition of bicarbonate of soda has no such danger. Then

again, the characteristic exercises are an important part of the Schott method.

Concerning foreign health resorts Sansom makes the following wise remarks:

"The patient is apt to misunderstand the word 'cure' as applied to the treatment of the foreign health resorts, and invests processes there with a certain glamour. He prefers, it may be, the counsel of a prophet who bids him do some great thing, to the advice of a friendly doctor who has carefully watched the signs of his disease."

High-pressure cases are often met with in men who literally lead a life of high-pressure. The successful business man who overworks and worries, and who uses alcohol, is very apt to develop arterial changes and a tendency towards pathologic high-tension. To such persons, and indeed to many others, the necessity of periods of relaxation as a requisite to the maintenance of health is very great. The most foolish thing that any successful man can do is to work throughout the year without an adequate vacation, and it is a rather curious practical observation, even among professional

men, that, in the long run, the actual income of the year is not diminished by taking several months of travel and recreation. The improved morale, the wider view of the world, and the coming in contact with new people, more than compensates for the actual loss of income during the period of cessation of work. Any man whose work is not purely routine is the gainer by a sufficient vacation, and by devoting some attention to the question of pleasure and rest.

When health is considered, in view of our present knowledge of the progress of the circulatory degeneration which goes hand in hand with the advance of years, and which, as previously stated, is particularly liable to attack those whose lives are most successful, the matter of rest and recreation becomes one of evident importance.

Unfortunately, if the pursuit of pleasure be put off too long, the faculty of the enjoyment of a quiet life is lost. It is extremely important that each individual should develop interests during early life that may occupy him during periods of cessation of work, so that

if the time comes when he suffers from high arterial tension, and is ordered by his physician to travel and rest, he may be able to take an interest in the things of the pleasure-seeking world and not fret and worry through a period of so-called relaxation, only to return to business to find even that distasteful because of ill-health. Instances of this kind have been observed in which it seemed the part of humanity to allow such a man to "die in the harness," as it has been expressed, that is, there are certain cases of the high-tension type that have gone beyond the point where much is gained by a change of occupation. It is important, therefore, that high-tension cases be early recognized, so that proper attention may be given to the conduct of their lives, and the care of their circulation.

The effect of temperament upon the progress of high-tension cases is marked. A man with a naturally cheerful disposition who is active in the pursuit of pleasure, even though this be accompanied by the abuse of stimulants, suffers less from the condition of high arterial tension than does the individual with the same

physical ailments who is prone to mental anxiety and depression. The reason for this is probably a complicated matter of the reaction of the brain upon the vasomotor system.

It is certainly a fact that many men prone to conviviality go on living with this high arterial tension in the circulation, while others of a different temperament sink rapidly through the grades of cardiac hypertrophy, broken compensation, renal insufficiency, and circulatory failure, to death.

Hence, the one most important condition in the management of high-tension cases is the removal, if possible, of overwork, particularly mental work, of worry, and indeed, all demands that may put the nervous system under a strain.

The truth of this is remarkably shown by the occasional observation of a man who, having developed high arterial tension, cardiac hypertrophy and albuminuria during the course of an exciting and successful business career, has finally put his affairs in the form of an estate, and settled down to a life of ease and enjoyment of quiet pleasures. In such a man I

found the heart large, but not overactive, an entire absence of arterial high-tension, the kidneys doing their work reasonably well, and indeed, the whole condition showing a state not characterized by advancement. This is no fancy picture, but a matter of actual observation.

There are a considerable number of men in the position where they must choose between a few years under the conditions in which they are at present, and a good many more years under circumstances of less strain.

No condition is so easy to remove temporarily by treatment as high arterial tension. The administration of an efficient dose of one of the nitrites is as striking in its effect as any therapeutic measure in all medicine. The trouble is that the effect is but transitory, and that there are certain disagreeable by-effects, such as irritation of the heart, if the doses are too often repeated. For this reason, much judgment is necessary for the proper administration of the vaso-dilators in high-tension cases.

Some physicians give these drugs three or

four times a day, and flatter themselves that they are keeping down arterial tension. Others, who know better, give the drug every hour, and really succeed in relieving arterial pressure.

The prolonged treatment of high-tension must be principally hygienic, but while we have not any belief that a few doses of nitroglycerine during the day will permanently effect a lowering of tension; still, while other methods are being employed it is a useful procedure, as it relieves blood-pressure at intervals, and gives the circulation an opportunity to take advantage of anything that is gained by other measures. As a matter of fact, in the earliest stages of this condition, a few doses may for a considerable time counteract a decided tendency to arterial tension.

In the treatment of high-pressure cases we are confronted with the fact that while we are treating high arterial tension, the greatest danger to be feared is secondary low blood pressure. The problem is to remove from the heart the demand for the maintenance of high-pressure in order to avert the time when,

through exhaustion, it cannot maintain even a normal pressure. The mere reduction of high-pressure by the dilatation of the peripheral arteries, when the demand on the part of the system for a high arterial pressure has not been removed, often results merely in an irritation of the heart.

This is often observed clinically when nitroglycerine is used indiscriminately and persistently in high-tension cases, particularly of the nephritic type. Quite frequently where a condition of irritation has come about, the substitution of digitalis will result in a calming of the circulation, and an apparent disappearance of tension that is surprising to those who have not tried this experiment.

The drug treatment of high-pressure cases must be managed by an intelligent observer who subordinates theoretic considerations to practical results.

The iodid of soda used persistently has a beneficial effect upon patients in whom there has been established a tendency to high-tension and progressive deterioration of the heart-muscle.

It has seemed to me, and my observations have been confirmed by others, that even in very bad cases of this kind, much advantage results from the use of this drug in this way.

Ordinarily it is prescribed in a solution of equal parts of iodid of soda and water, and given in doses of two to fifteen drops in half a glass of water after meals. It is a matter of experiment to determine how much each patient can tolerate. Ordinarily five drops can be taken over a long period of time, although a considerable number of patients can only take two or three.

CHAPTER VI

SOME OBSCURE SYMPTOMS OF CIRCULATORY DISORDER, WITH A CONSIDERATION OF THEIR SIGNIFICANCE

Not all symptoms of circulatory failure are comprised in dyspnea, edema, and visible congestion or anemia, though these are the cardinal indications. There are certain symptoms of obscure origin that are traceable to circulatory disease, and are only overcome when that is given proper attention.

In elderly people one of the most frequent and troublesome of symptoms is that of head noises. I have under observation at the present time no less than four patients who have suffered over long periods of time from noises referred to the ear, which they described as puffing or blowing sounds, and which have been extremely annoying. These patients had all been systematically and heroically treated for ear disease without benefit, but when the

circulation was properly controlled the noises became so slight as not to be complained of, and a good deal of the time not to be noticed.

These patients are usually found in the group of commencing secondary low arterial tension. The explanation of these sounds would seem to be the circulation of blood through badly filled blood-vessels in the neighborhood of the organ of auditory sensation.

There is no class of cases that has given greater satisfaction, because it is possible to relieve a condition that has caused much suffering, particularly at night.

Another obscure manifestation of circulatory disorder is the simulation of slight attacks of paralysis. These are often overlooked unless they are watched for. They consist of a temporary slight loss of power of a transient nature, on the right or left side of the body. The patient usually describes the attack as a "clumsiness" of a leg or an arm. If on the right side of the body there is sometimes a slight loss of power of speech, in that certain words are missing. The patient usually considers this a temporary failure of memory. These manifesta-

tions are the same as often indicate more serious disease of the brain with impending thrombosis. However, in many cases, attention to the general circulation will entirely remove the symptoms, so that it is hard to believe that the condition was purely local in origin.

There is a class of obscure symptoms of circulatory disorder which consists of pain in various parts of the body. How much of this is purely circulatory, and how much of it belongs to the gouty, rheumatic, and nutritional disorders that are common in the same class of patients, is often hard to determine. It is suggestive that these painful conditions arise at times of circulatory debility and improve when the circulatory disease is in abeyance. Attacks of sciatica of a persistent and troublesome nature are particularly apt to occur in patients commencing to suffer from secondary low arterial tension.

There is a really pitiable set of patients that might be mentioned here, though perhaps not quite logically. These are the patients who have developed a very painful and chronic neuritis subsequent to attacks of extreme circula-

tory edema of the lower extremities. It may be only a coincidence, but these have been among the most difficult patients to relieve that have come under observation in connection with the treatment of circulatory disease.

The obscure symptoms of circulatory disease would not be complete without a consideration of the things that may happen during the stage of high arterial tension. Nose-bleed of a troublesome character is a frequent occurrence, and in cases where one is puzzled to decide between primary and secondary low arterial tension, the history of a period during which nose-bleed was very troublesome may be of help. It is surprising how often this history is elicited from patients who come for the first time in the stage of broken compensation.

The number of conditions due to congestion secondary to general circulatory disease that are mistaken for diseases of local origin, is very great. The most striking of these is, perhaps, congestion of the liver.

This condition develops gradually, so that the blood becomes congested in the liver, giving rise to functional derangements of this

organ, and of the other organs of digestion. The liver is enlarged and tender on pressure, and the condition is often accompanied by very marked disorder of the stomach, on account of which it is frequently mistaken for primary gastric disease. That this is not the case is proven by the fact that the condition is relieved only when the circulation is strengthened.

There is a class of cases in which circulatory disorder is shown in its pulmonary effects. There is persistent congestion of the lungs, often with a tendency to the accumulation of serum in one or both pleural cavities. These patients may often have a fairly good systemic circulation and very obscure indications of cardiac disease. The interference is apparently with the function of the right side of the heart. Two patients of this character were watched over a long period of time, while the pulmonary congestion, involving repeated attacks of bronchitis and slight edema, rendered them incapable of work. The symptoms of circulatory disorder are obscure because so much more accentuated in the thoracic organs than elsewhere.

Circulatory disorder may also show itself in its effect upon the function of the brain by attacks of acute mania, or more often by the development of a chronic mania.

Changes in the arteries in elderly people are apt to be characterized by changes in disposition, by affections of the memory, and by impairment of judgment. That these symptoms are traceable to circulatory derangement is shown by the fact that their course is markedly affected by the treatment of the circulation.

Disorder of the circulation in persons past maturity is sometimes shown by so striking a manifestation as general convulsions. These patients are often supposed to be suffering from idiopathic epilepsy. However, the attacks are so promptly relieved by appropriate treatment directed to the circulation, which would have no effect whatever in epilepsy, that this may be eliminated from the diagnosis. Of course, there are relatively rare cases in which real epilepsy begins late in life.

A group of symptoms on the border line between neurotic and circulatory disturbances forms in its sum-total a large proportion of the

sufferings of humanity. Abnormal sensations in the extremities, numbness and tingling of the hands and feet, a feeling of formication extending up the legs and thighs, abnormal coldness of the hands and feet, cramps in the muscles of the legs occurring at night, and the tendency of the extremities to "go to sleep," as it is called—all these things may be pure neuroses, but often enough there is a circulatory element in their causation.

As in a preceding paragraph in this chapter, we may again suggest that the therapeutic test will decide how much of this is due to disorder of the circulation. Many times the symptoms disappear when the circulation is properly regulated. A few doses of nitroglycerine have stopped all complaint of cold extremities in many patients of this type. The possible severity of pain due to interference with the circulation is well shown in cases of embolism of the extremities in the course of circulatory disease. No one who has observed this accident will doubt that pain of the severest type may be due to interference with the circulation.

CHAPTER VII

THE MANAGEMENT OF SECONDARY LOW-PRESSURE CASES

THE treatment of low blood pressure which is secondary to long-existing high-tension conditions has two elements—first, the correction of circulatory errors by the action of drugs which have the power to modify physiologic forces in various parts of the circulatory circuit, and, second, the restoration, as far as possible, of the health of the tissues upon which derangements of function are often founded.

The attention in diseases of the circulatory apparatus is too often concentrated upon the first. In instances of temporary embarrassment, or of extra demands on account of complicating diseases, this first element becomes of supreme importance, but in the long-run it is the second element upon which success in the care of circulatory disorders is dependent.

In this connection it is important to differentiate between the symptoms and the disease. Dropsy of the dependent portions of the body is a symptom which does not always demand treatment. If of moderate degree, and dependent upon well-understood causes, it is often the part of good judgment to undertake the second element of treatment, neglecting for the time being the symptom, the removal of which would require intervention in the physiologic activity of the heart, such as might neutralize treatment directed to the circulation as a whole; indeed, there is often much harm done in such cases by violent attacks upon symptoms.

Most writers on circulatory disease have passed over with scant consideration the management of cases with general edema and steadily progressive symptoms, which, if not checked, uniformly lead to a fatal termination. It is unscientific to disregard these cases in considering various forms of treatment at length, dismissing them with a single clause. This is frequently done in speaking of the Nauheim treatment, progressive cases being usually spoken of as unsuitable. There is al-

ways the possibility in any particular case that we may be mistaken in our estimate of it, and the patient is entitled to the treatment even at the risk of discrediting the system by the limitation of results because of the severity of the case.

As physicians engaged in the general practice of medicine, who must do our best for those who place themselves under our care, it is our duty to study the best plan for every stage of a case, and to contest skilfully and hopefully every sign of the progress of disease. In the whole range of circulatory disease there is no condition which will so tax the knowledge and patience of the physician as the management of this low arterial tension which is secondary to high arterial tension.

The importance of recognizing this class of cases is very great, because the methods of treatment which tend to the relief of the condition are not those which give the most satisfactory immediate symptomatic results, or those which are applicable to low blood pressure which has not been preceded by high arterial tension.

It is true that with many of these patients we are justified in the use of means which temporarily give relief and symptomatic results.

In primary low arterial tension the heart-muscle is in a position to recover its tone if depleted by acute disease, or to develop a compensatory hypertrophy if overtaxed by defective valves.

In secondary low blood pressure the heart has already for the time being exhausted its power of compensatory hypertrophy, and, while the tendency to resistance in the arteries persists, there is no adequate response on the part of the heart.

Little is gained symptomatically in extreme cases by the use of vaso-dilators, because the blood-pressure is already low. Little is gained by digitalis, because the heart-muscle is not in a position to respond. The combination of drugs of the digitalis group with drugs of the nitrite group produces a certain amount of symptomatic response, but in the end does not produce permanent results unless combined with measures that will hold the advantage

gained. Excessive drugging is a mistake. A single large dose of digitalis at night is often better than divided doses. A good fluid extract put into a capsule and swallowed at bedtime, the dose being determined by experiment, has often proved very satisfactory. Attention to the digestive organs is often of the utmost importance. Milk is often badly borne and should be replaced with the most nutritious food that will agree with the patient.

As often as possible these patients should be put upon a regimen directed to the improvement of nutrition and to the healthfulness of the body in general, hydrotherapy in the form of warm saline baths, a nutritious diet without too much regard to theories as to gout or disease of the kidneys, and exercise in the open air up to the point where dyspnea interferes.

We are dealing often enough with dangerous conditions, and it is not possible to compare the result in a particular case with what it would have been under other circumstances. A man must be of limited experience indeed who has not seen such a patient do better when disregarding advice that planned treatment of

such a condition by too long rest in bed and a diet too restricted. In cases of threatened circulatory failure those remedies that have a demonstrated physiological action on the circulation are tools to be used for the correction of defects of action while the hygienic measures mentioned above are repairing any shortage in vitality. Each drug should be exhibited by itself and ready mixed tablets or combinations reserved for less serious cases. A good plan is to divide the day into periods of one or more hours and state definitely when each dose is to be taken. Thus the circulation is regulated by various adjustments much like a machine. Vaso-dilators in the evening are often well borne and useful in the same case in which they are harmful in the morning.

The vitalizing effect of a change of climate, a change of food, and of massage and exercise should always be remembered. Under wise management a patient, the subject of progressing circulatory failure, can many times be rescued from a situation which seemed at first most discouraging.

CHAPTER VIII

GENERAL CONSIDERATIONS

In the previous chapters the author has systematized his conclusions in the interpretation of blood-pressure as affecting the heart, brain, kidneys, and general circulation.

In order to obtain an expression of opinion, there was published, just previous to the writing of this little book, a series of short articles in various medical journals. These elicited enough discussion to show that the subject is one in the mind of many general practitioners. Among the articles, one entitled "The Importance of Treatment in the Early Stages of Arterial Degeneration"* was commented upon by Dr. Beverley Robinson, of New York, and others, as being a true picture of the condition described. The points brought out were that the term degeneration of the arteries is a better

* *Medical Record*, April 2, 1904.

term than arteritis, arteriosclerosis or endarteritis, because it is less definite and can be made to include functional as well as material vices. This condition is the result of the many causes which act in opposition to the tendency of life to go on without loss of quality or impairment of power—in other words, it is the failure of repair, and the failure in the action of the mechanism for the automatic correction of irregularities in the circulation.

The light thrown upon this condition by pathology is extremely unsatisfactory because we often find a most advanced arterial sclerosis without marked symptoms, and we find marked symptoms with hardly appreciable physical changes. The degeneration of function is more striking during life than degeneration of tissue. So long as we have to deal, then, with living people, the perfection or otherwise of the processes of life is the important element. This element is entirely beyond the view of the microscopist.

The failure of circulation may be due to functional causes as much as to a condition represented by appreciable structural change.

The teaching of modern science has been too much in the direction that phenomena can be wholly explained by structure. This is not true of the working mechanism of the human organism, nor indeed is it true even of mechanical things.

I was much struck recently by a description of his own case as given by a gentleman who has achieved success in life through the able manner in which he has managed a railroad. He is suffering from circulatory failure, and said: "I think I am like one of the old engines on my railroad—about ready for the scrap-heap. You may be able to patch me up and keep me going for a little while, but you cannot make me new again." He said that when an engine first came out of the shop it could do two hundred miles a day, and at the end be just as good as at the start. After a while there would be a little leak in one of the valves and it would have to go to the shop to be repaired. Later on another valve would leak, and then there would be trouble with the fire-box. When this once began, though each time the engine came out of the shop it would

appear to be all right, it would always be going back again, and at the end of a hundred miles one might always expect something to be wrong. He said further: "I employ a master mechanic to overhaul the engines every morning, and in this way we manage to keep them going, even though they are old; but there always comes a time when repairs do not pay, and then they are sent to the scrap-heap." This was a simile more true than pleasant.

There is something about a piece of machinery that has borne the stress of hard usage that is very like the behavior of the human body under the same conditions. It pays in the long-run to buy new machinery, and it would certainly pay to get a new body if that were possible. A new automobile can be managed and kept running by one of little experience, but to keep an old one running requires the knowledge of an expert.

Machinery can be replaced, but for the human being there is only one body as far as we know, so we must make the best of it. For this reason the study of the repair of the failing human organism and the discovery of all

those methods by which it may be kept smoothly running are well worth our best efforts.

The human organism is a much better machine than any invented by man. It has within itself arrangements for the repair or concealment of the earlier manifestations of many serious affections. In a way this is a disadvantage, because the earlier signs of degeneration are only to be detected by the trained perception of a skilful observer. This is particularly true of the circulation. The earliest sign is an irregularity of tension in the arteries, and this goes on to a pretty constant high arterial tension. The inherent forces conceal the defect whenever they can and bring about a compensatory hypertrophy of the heart.

This is the time when it is a pleasure and satisfaction to the physician to step in, and by proper régime and treatment regulate the arterial disorder, and the causes which are leading to it. Once in a while there is a patient who will submit to regulation before the appearance of conscious symptoms. The great majority of such cases, however, have come un-

der my care only at the stage when the hypertrophied heart, having wearied of the burden of maintaining the high blood pressure, has become feeble and probably dilated. Such was the case of the patient who compared his state with that of the broken-down motor. He presented the picture of cardiac failure—the heart dilated, with blowing murmurs, a feeble and irregular pulse, shortness of breath on the slightest exertion, albuminuria, and anemia. It was a case in which medical aid was sought only after the reparative powers of the body had exhausted themselves. Two years, or even one year earlier, the process might have been checked, so that the scrap-heap's day would have been much longer postponed.

To make an estimate, which must be purely a guess, the expectation of life is in inverse proportion to the postponement of treatment after the earliest signs of irregularities of arterial tension due to the changes of degeneration.

In a paper read before the New York County Medical Association* entitled "Ergot in Sur-

* Annual Meeting, April 18, 1904.

gery," Dr. Alfred T. Livingston, of New York, said: "In this connection I commend to your perusal and careful consideration a brief but most valuable and pertinent paper by Dr. Louis F. Bishop, of your city [see current volume of Journal A. M. A., page 820]. The paper in question reads as follows:

"The Relation of Nature's Provision for Heart Stimulation and Control to the Use of Cardiac Drugs in Acute Disease.

"Before plunging into the indiscriminate use of drugs which have the property of causing the heart to beat more strongly, it is well to consider what provision has already been made in the same direction by the body itself, and also what is the precise object of such intervention in a particular case.

"The heart is wonderfully responsive to the demands of the body when subject to exertion or disease. In acute conditions, stimulation in the sense of urging the heart to expend more energy, is seldom demanded except in sudden emergencies. Fever is a great heart stimulant, as is also inflammation.

"The use of the term 'heart stimulants'

in reference to drugs that are used in the course of disease with the idea of assisting the heart and preventing the failure of its powers when they are most needed, is a crude employment of words, and has led to much misconception. Who would think of whipping a horse that was already struggling under an unusual load, or further opening the throttle of an engine when it was going too fast?

"The fact is that we have but few heart stimulants in the true sense of the word, and we hardly ever use these. The only time when drugs are used with the direct purpose of stimulating the heart is in sudden emergencies. Then we avail ourselves of the fact that many drugs which are useful as heart regulators also possess the property of temporarily stimulating the heart. The best heart stimulants, however, such as ammonia, ether, and nitrite of amyl, are poor regulators, and the best regulators, such as digitalis, strophanthus, and iodid of soda, are poor stimulants when quick action is needed.

"The whole question of heart stimulation needs revision in its clinical aspect. A good

beginning could be made if the term 'stimulant' were dropped entirely and the idea of regulation substituted. A hundred lives are saved by the judicious control of the over-stimulation which results from disease, where one is saved by direct stimulation as such. The only excuse for the use of heart stimulants is that they have been misnamed, and are useful as regulators.

"The misconception of the importance of stimulation as an element in recovery from disease has unquestionably led to much harm. When in a very sick person it is found that the pulse is slow, reflecting only the weakness of the patient, one should rather rejoice than otherwise. Circulatory failure does not, as a rule, take place in this direction. Primary low arterial tension without excessive rapidity is not ordinarily dangerous if let alone. Such a heart may carry on its work successfully, while if injudiciously drugged, it may be so exhausted that if the stage of the rapid and feeble heart be reached, there may not be reserve force enough to carry the patient through the disease. I have repeatedly seen cases in which, on account of simple feebleness of the

pulse in acute disease, the patient had been drugged beyond measure, with the result that the heart and pulse were showing most erratic action, but in which, the occasion for the original stimulation having passed, the withdrawal of all drugs soon restored the heart action and pulse to normal.

"Failure of the heart most frequently takes place in the direction of increased rapidity. This is probably due to the failure of a very radical element in the living organism known as inhibition. In connection with the heart, the nerves which conduct this impulse from the great nerve centers which seem to be the center of life, are well known. The same influence in one form or another affects every organ and tissue of the body. On it depends co-ordination in every vital process. An instance of its failure to act is seen in increased patellar reflex, due to cutting of the path of connection between the brain and the muscles of the thigh.

"So increase in rapidity of the heart in disease tending to dissolution is a very radical thing, and is only successfully combated by measures influencing vitality itself, such as im-

proved nutrition of the whole body, improvement of the nervous system at large, and the removal of those things which are acting contrary to the interests of the whole physical economy. I can remember as a medical student, bringing to bear, when opportunity afforded, every known heart drug in the attempt to control the rapid and feeble heart action of dying patients, and I could not understand at that time why so little was accomplished.

"In acute disease, while there is life there is hope of the restoration of the patient to health, so one must strongly advocate the most strenuous efforts to the very last to avert the tendency to death; but there are certain limits beyond which drugs having a direct influence on the heart are no longer useful. If the patient is to be saved it must be done by the restoration of the inhibitory force by measures directed to the restoration of the whole bodily economy. Hence the value of strychnin, of hydrotherapeutics, of nutrition, and above all, of sleep, and the removal of exhausting influences.

"Interesting as they are, and important, the consideration of the mechanics of the circula-

tion must give way to the consideration of the patient himself as an individual. There is a trite saying that a man is as old as his arteries, and in acute disease it may be said, as a rule, that the heart is as good as the man.

"The moral of it all is that in acute disease the question of cardiac drugs is a matter that must not be lightly considered."

In *American Medicine,* April 23, 1904, was published a brief note entitled: "The Importance of Considering the Element of Vasomotor Instability in Estimating the Significance of Irregularity of Cardiac Rhythm," which read as follows:

"The frequent discrepancies between the heart-sounds as heard by the stethoscope and the pulse as determined by palpation must have impressed all observers. It has been a matter of surprise that hearts, which, by their sounds, seemed to be doing good work, were often accompanied by a pulse giving a poor impression, and, on the other hand, cases showing irregularities of the heart-sounds have been associated with a pulse showing a fair degree of regularity.

"When it is remembered that, in the light of evolution, the heart is constructed of the same elements as the blood-vessels, and is only a differentiation of the circulatory tube, and when it is appreciated that not only the blood of the heart, but the blood of the whole circulation, is surrounded by a muscular envelope that maintains its pressure, it can easily be seen that in palpating any portion of this blood-containing system, the variations in pressure will be a complex of the whole envelope, and not merely of its strongest portion.

"The vasomotor system is much more liable to disorder than the heart, and the heart is able to compensate for a good deal of misbehavior on the part of the vessels, but in compensating it often appears to be misbehaving itself. Thus, one may fall into the error of predicating disease of the heart-muscle when the trouble really is a functional derangement of the blood-vessels. In many of the cases that are strikingly benefited by the Nauheim treatment the results are undoubtedly obtained by a restoration of the peripheral circulation, and

the relief of the heart from a struggle to compensate for it.

"Not only clinical but pathologic study confirms the fact that diseases of this class, including myocarditis and nephritis, have their origin most often in degeneration of the blood-vessels, at first functional, and then organic. The coronary arteries of the heart become involved and then the heart-muscle suffers. The vaso-vasorum of the blood-vessels suffer, and then the larger vessels, so even in the early stages of circulatory symptoms, the relationships should be appreciated and the hygiene of the peripheral circulation becomes a matter of serious supervision."

This elicited the following reply from Dr. Albert Abrams, of California (author of "Diseases of the Heart; Their Diagnosis and Treatment"), who, under the title: "A Clinical Method of Determining the Vasomotor Factor in Blood-Pressure," * said:—

"Dr. L. F. Bishop, in a contribution on 'The Importance of Considering the Element of Vasomotor Instability in Estimating the Sig-

* *American Medicine*, May 28, 1904.

nificance of Irregularity of Cardiac Rhythm,' published in *American Medicine,* April 23, 1904, directs attention to a significant clinical paradox, viz., the discrepancy often existing between the heart-sounds and the pulse—in other words, the vigor of the one cannot be gauged by the strength of the other. My own observations tally with those of Bishop. I have frequently noted among arteriosclerotics and others, that a high blood-pressure is often coupled with the local evidence of cardiac incompensation. When the heart-tones are weak, increased blood-pressure can never indicate a vigorous heart-action, and in estimating the vigor of the latter, blood-pressure is of subsidiary value only. When high blood-pressure coexists with cardiac enfeeblement, a vasomotor factor is concerned in the maintenance of the former, this increase in the peripheral resistance of the blood-vessels acting as a prop to the enfeebled heart. In other words, the arterial system serving the objects of compensation acts as a subsidiary heart, which in turn facilitates the circulation of blood. In this way, as I view it, the nervous system, through

the vasomotor nerves, may compensate an impaired myocardium.

"I have accumulated sufficient data to warrant recommending the following method for determining the vasomotor factor in the clinical measurement of blood-pressure. In my observations, the Riva-Rocci instrument was employed. After determining blood-pressure, according to the conventional method, the patient is instructed to inhale amyl nitrite from a bottle, after which procedure the blood-pressure is again estimated, and the difference noted. The arm-piece of the instrument need not be removed until the investigations are completed. The patient must be instructed not to practice forced breathing while inhaling amyl nitrite, as observation has taught me that this physiologic act alone will reduce blood-pressure, and thus negative the clinical findings. Sufficient amyl nitrite must be inhaled to induce its physiologic action, viz., slight duskiness of the face, fulness in the head, and relaxation of the blood-vessels. The average effect of inhalation of the drug in the normal subject is to cause a slight increase of

blood-pressure, varying from 2 mm. to 20 mm. The primary effect is to depress slightly the blood-pressure, but it rises at once. I am inclined to conclude that in the average healthy individual inhalation of amyl nitrite relaxes the arterial walls by eliminating the vasomotor influence, thus bringing into play the veritable cardiac pressure. My observations, extending over a period of one year, permit me to formulate the following conclusions:

"1. Blood-pressure is an expression of action of two chief factors, ventricular force and vasoconstriction.

"2. Inhalation of amyl nitrite dissipates the vasoconstrictor factor, and brings into play the ventricular force which is the real factor to be encouraged in a failing heart.

"3. The vasoconstrictor factor may and does compensate myocardial inadequacy, for it is essential in most cardio-arterial diseases for the blood-pressure to be maintained to afford better nutrition of the heart, and to augment arterial elasticity as a means of establishing the blood circulation.

"4. The recognition of the myocardial and

vasomotor factors in blood-pressure guides us correctly in the administration of cardio-tonics.

" 5. In the individual endowed with cardiac health, the removal of the vasomotor factor by inhalation of amyl nitrite causes an increase in blood-pressure, whereas the converse condition causes the latter to fall and the degree of reduction is proportionate to the degree of cardiac enfeeblement. In other words, the high blood-pressure in myocardial disease is maintained by an augmented tonus of the vasomotor center. Thus the blood-pressure may fall from 240 mm. before, to 180 mm. after, inhalation of amyl nitrite in arteriosclerotics with enfeebled hearts. Even this reduction in blood-pressure is not low enough to correspond with the tones of the feeble-acting heart, hence one is constrained to conclude that the action of the amyl nitrite does not suffice wholly to eliminate the vasomotor factor.

" 6. The execution of the foregoing maneuvers in estimating heart vigor is by no means comparable to a correct method of cardiac auscultation, although the latter method does not indicate how much of the cardiac force may be

attributed to increased peripheral resistance; cardiac auscultation, in conjunction with the sphygmomanometer and the inhalation of amyl nitrite, constitutes the ideal method for eliciting the real condition of things.

"7. In estimating blood-pressure the sphygmomanometer only gauges the force of the left ventricle, and to determine the sufficiency of the right ventricle, auscultation of the pulmonic sounds and a physical examination of the lungs are alone adequate.

"I have encountered a number of individuals with very high blood-pressure, and who demonstrated no cardiac anomaly, yet the blood-pressure remained the same after as before the inhalation of amyl nitrite. In about half of these individuals the urine was light in color, of low specific gravity, contained a trace of albumin, and was excreted in increased quantities. Albumin often disappeared when the blood-pressure was spontaneously lowered, to reappear when the pressure rose, hence the albuminuria in such instances could be correctly designated as the albuminuria of high blood-pressure."

With reference to "Constitutional Low Arterial Tension,"* the following was published: "It will be found that there are many patients who give evidence, on the most casual examination of the circulation, that the tension in the arteries is very slight, and in some this will be found a constant condition. It is surprising how little tension there can be in the radial pulse without the patient suffering from any symptoms of circulatory disease.

"This low arterial tension in otherwise apparently healthy individuals, is undoubtedly a departure from the normal. It may be due to an unusual relaxation of the peripheral circulation which makes it possible for the heart to do its work with but little effort. Some of these patients are generally feeble, lacking in nerve force and unequal to strains. Others, however, seem to respond to demands for physical or nervous effort, and when so responding there is an improvement in the tone of the circulation.

"When seen for the first time during some

* *New York Medical Journal and Philadelphia Medical Journal*, June 11, 1904.

acute affection this condition may give rise to apprehension on the part of the physician as to the outcome of the illness for which he has been summoned. When, however, the patient can be watched from year to year and is seen to get along perfectly well, even though there is this lack of tone in the circulation, the physician comes to realize that with that individual it is a physiologic condition.

"There is another form of low blood pressure that is of much more importance, and that is the low blood pressure which succeeds the high arterial tension of chronic Bright's disease. Here we have to deal with a most serious complication of the disease. It means that the circulation is no longer maintained by the heart. Thus, it may be stated that low arterial tension may exist in certain individuals without great significance, but that if it has been preceded by high arterial tension it is a factor of grave import. With this condition we have nothing to do in the present discussion, but rather with low arterial tension that is a reflex of a constitutional condition.

"Experience has shown that nothing is gained with these individuals by the use of drugs to increase arterial tension. It is quite possible to make the pulse for the time being approximate the normal; indeed, this often happens spontaneously when the heart and circulation are physiologically stimulated by exercise or fever.

"The condition is, in all probability, due to an inherent defect in the nervous system, whereby it does not exercise the proper control over the blood-vessels. The same patients who suffer from this low arterial tension are very apt to manifest other symptoms of defective nervous control, and the removal of the underlying condition will bring about an improvement in the circulation.

"The most important element of treatment is systematic exercise. These patients are often dependent for their well-being upon regular physical exertion. Often they feel much better if they can take a brisk horseback ride every day, or some other form of stirring exercise. There are other cases in which it is found that iron and arsenic improve the condition when it

becomes very marked. In still other cases very hot baths take the place of vigorous exercise and improve the tone of the circulation. It should be remarked that this is a secondary effect, because, if the circulation be examined immediately after the bath, it will be found to be more relaxed than usual.

"Although one would expect beneficial results from cold bathing, it is found by experience to be unsatisfactory in cases of constitutional low arterial tension. Such subjects do not react, and the effect is not satisfactory.

"These observations refer to a class of patients who are not suffering from any definite disease, but who realize that they are not the same as other people. They have probably been told that they are suffering from a variety of diseases, according as the phenomena were supposedly traced to one or the other organ. To them may be applied the rather trite remark that they are suffering from a condition rather than a disease. Such patients are fortunate if they come under the care of a practitioner who will appreciate the condition and manage it

properly. The worst thing that can happen is, that there should be repeated efforts to cure supposed local disease by different men succeeding one another."

CHAPTER IX

THE ESTIMATION OF BLOOD-PRESSURE AND THE USE OF THE NITRITES FOR ITS MODIFICATION

THE estimation of the condition of the circulation usually represented by "feeling the pulse" stands for a very important procedure in the routine of the practice of medicine, and is the one element of a physical examination that is probably never neglected in any case, or in any country. For this reason the estimation of the pulse, while it has not always lent itself to the most scientific classification, still to the individual physician represents a remarkable amount of experience and observation, checked by the findings of subsequent events. Now, while many physicians are unable to express in words what they feel in the pulse, still, very often indeed their conclusions are correct.

The tactile estimation of relative blood-pressure as determined by the experienced touch, and checked by clinical symptoms, is often correct, on account of this high degree of training. There is a possibility that some of this great skill of the profession might be lost if instrumental observation should possibly take the place of direct examination, just as we have lost skill in measuring fever. However, the introduction of instruments of precision far outbalances the benefits of the skill created by their absence.

We all, however, must acknowledge that it is absolutely impossible, with the fingers, to estimate the subsequent reading of the sphygmomanometer in cases which we know to be high when they are above 170 millimeters, also low tension cases often appear much lower to the touch than they are actually proved to be. The educated touch can often decide whether a pulse is normal or not, and all instrumental blood-pressure findings must be discounted by allowing for hypertonic contraction, particularly when very high readings are obtained.

For a long time I have felt the need of an

instrument that would quickly and easily decide the presence or absence of high and low arterial tension.

The simplified instrument that I have used until very lately consists of an armlet 15 centimeters wide and 40 centimeters long, made of strong cotton material. This armlet or cuff differs from the Rivi Rocci armlet in its greater width and in the fact that the rubber bag occupies only part, instead of the whole, circumference of the arm. The advantage of this latter arrangement is that the rubber bag when expanded compresses the artery against the bone, rather than surrounds the whole arm which proved to be painful. Connected with the cuff is a red rubber tube, 203 centimeters long. To this is connected a white tube 60 centimeters long and to this a blue tube and a blue bag, measuring from the center of the bag 136 centimeters. Connected to the blue rubber bag is a cord passing through a pulley of special construction. This pulley is so constructed that it can be easily hung at a height by means of a cane or a similar implement. There is a special scale which is attached to

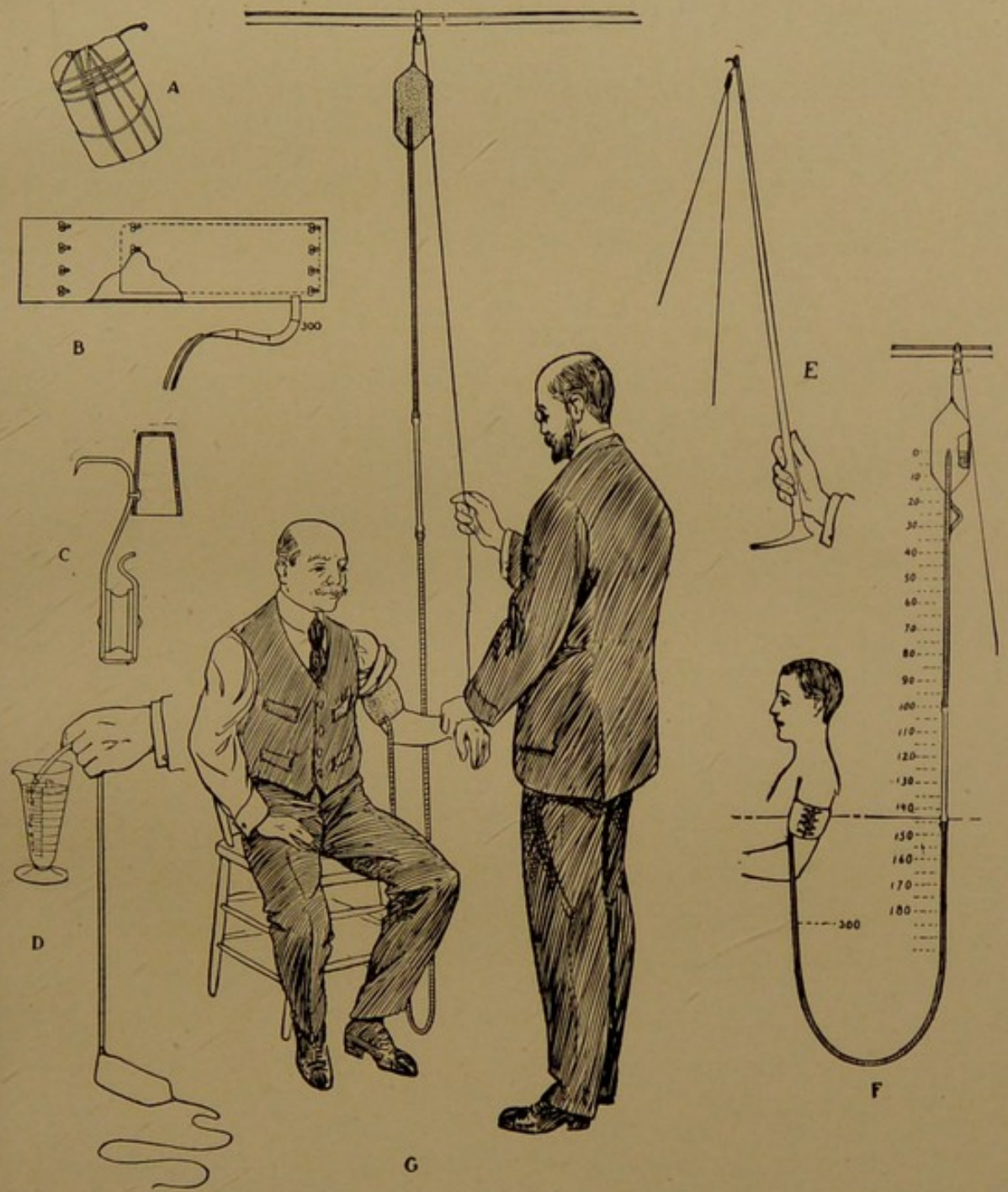

FIG. 1. AUTHOR'S BLOOD-PRESSURE DETECTOR.—(A) Folded for carrying. (B) Cuff and scale. (C) Hanger. (D) Method of filling. (℥xii of water is allowed to syphon in after sucking out the air.) (E) Hanging the pulley by means of a cane. (F) Diagrams showing hydrostatic principle. (G) Instrument in use. The cuff is laced on the arm and the point on the scale opposite the level of the heart when the pulse disappears on elevating the reservoir gives the blood pressure in millimeters of mercury. The blue portion of the scale indicates low pressure, the white normal and the red high pressure.

the bag at the level of its contents, and is used to ascertain the blood pressure in terms of millimeters of mercury. The instrument can be rolled up and carried in the pocket, and is used as follows:

The tube is separated at one of the connections and the air is drawn out of the two bags by suction, by placing them one at a time in the mouth. The bags are now placed on the floor and the ends of the tubes plunged in a basin of water and about 12 ounces allowed to syphon into the bags. The ends of the tube are now rejoined under water so that no air can enter. The red cuff is now lifted up so that all the water runs into the blue bag, which is left on the floor. Then the armlet is laced around the arm of the patient in such a manner that the part containing the bag comes on the inside of the arm. The pulley with the cord to it is now attached high up to a picture moulding or some other convenient object, and the bag is hoisted slowly until the pressure of water that had flowed back to the cuff has compressed the brachial artery and obliterated the pulse at the wrist. To find the exact point at which this takes place it is better to lower

the bag until the pulse is distinctly felt again, and then raise it two inches at a time, counting five beats of the pulse each time until the pulse disappears. If at this point the white tube be opposite the level of the patient's heart, or the level of the middle of the cuff, which is practically the same, having the patient in a sitting position, the patient's blood pressure is within normal limits. If the blue tube is opposite this level the patient has a subnormal blood pressure. If the red tube the patient has an increased blood pressure. In order to measure the blood pressure in terms of millimeters of mercury, the special scale is attached to the blue bag at the level of the water in it when the apparatus is in operation, and the figure on the scale at the level of the heart when the pulse disappears indicates the blood pressure in millimeters of mercury. The small diagram shows the hydrostatic principle.

This apparatus has been compared in all kinds of cases with the standard instruments and its readings found correct. A closer reading is often possible with this instrument than with the other instruments on account of the

absence of the troublesome fluctuations and the greater length of the scale. This is particularly true in low pressure cases. The instrument is especially convenient for detecting the cases of blood-pressure that fall into my classification of blood-pressure cases, into primary low pressure cases, high pressure cases and secondary low pressure cases. It is not convenient for the measurement of very high pressure cases on account of the great elevation of the pulley that is necessary. Diastolic pressure may be read at the lowest point where the patient feels the maximum pulsation in the arm when the pressure is varied. An elevation of six feet is sufficient for normal and low cases. While water is desirable for use on account of its unchangeable specific gravity, a heavier fluid can be substituted so that sufficient elevation can be obtained by raising the arm, and the graduation of the scale made to correspond. An instrument filled with a solution of Cadmium borotungstate is used by the author for the carrying in the pocket.

The author's sphygmoscope is an apparatus for measuring blood pressure with special reference to the easy measurement of diastolic

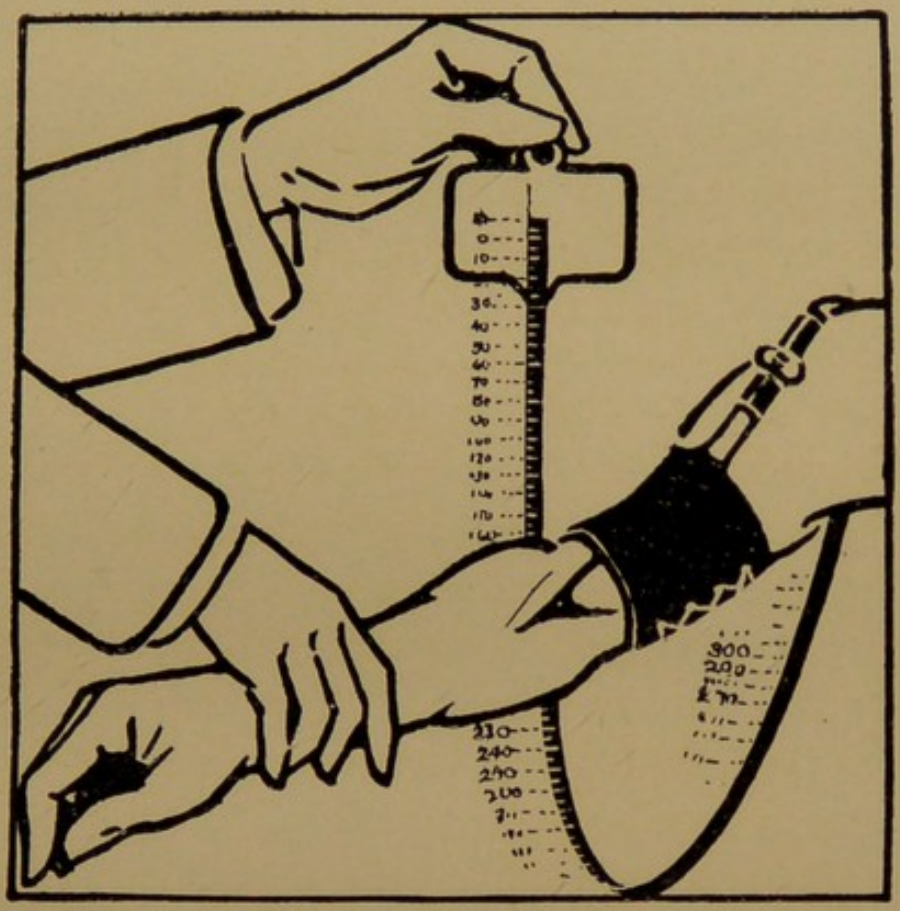

FIG. 2. THE AUTHOR'S SPHYGMOSCOPE

pressure. The sphygmomanometer is constructed on the same principle as the instrument already described, but inserted in the tube near the cuff is a little glass arrangement, consisting of a tube with a lens blown on the surface of it. The lens is of such shape that its focus is at the center of the tube, and it magnifies the motion of any object in the tube in the direction of the length of the tube.

Inside of the tube, there is a floating index.

This index reveals any wave motion there may be in the fluid, the motion being magnified by the lens so that very slight waves are easily perceptible. In the figure, the sphygmoscope is seen resting against the shoulder of the patient. It is used as follows:

The cuff is laced on the arm with the bag over the brachial artery; then the reservoir bag is elevated to some point that is probably between the diastolic and systolic pressure, for instance, 100 in most people. When the fluid has reached an equilibrium, the tube is pinched just below the reservoir, and immediately a pulsation is visible in the sphygmoscope, corresponding to the pulse in the brachial artery. The reservoir is now lowered a little bit, and the tube again pinched and the pulsation observed. This is repeated until a point is reached where the pulsation becomes suddenly and markedly diminished. This is the diastolic pressure, being, according to Marey's criterion, the lowest point at which the maximum pulsation is conveyed from the artery to the compressing medium. Systolic pressure is determined as described above.

The point that we wish to make in this chapter is the necessity for greater conservatism in the use of vaso-dilators in certain cases of cardiovascular disease. In the career of every form of treatment there are several stages. The first is discussion, then, skepticism having been overcome, adoption. The second is intelligent application in the light of previous discussion and the consequent general information. Third, the routine use of an accepted treatment as a matter of course in a particular disease.

When Brunton applied amyl nitrite to the treatment of angina pectoris, he achieved a signal triumph in therapeutics. Not less was the triumph of the more gradual application of the nitrites in general to the treatment of vascular spasm. These were first well used by those who had witnessed their development and were familiar with their philosophy and limitations. Unfortunately the student coming later upon the field of medicine, and finding the nitrites in general use for vascular disease, jumped naturally to the conclusion that they were the remedies *par excellence* and used

them in a routine way in the treatment of these cases. The observation of this fact makes it seem useful at this time to emphasize the necessity of some conservatism in this matter. It is a trite saying that we should always treat the patient and not the disease, meaning by this that we must carefully recognize the exact physiologic and pathologic conditions present, and so influence them as to bring about the cure of disease. Patients differ widely in their behavior under the nitrites, and for that reason every case requires physiologic study to determine the amount of drug necessary and how it should be applied.

There is no more important function of the physician than the early recognition of that tendency to degeneration and death that comes prematurely to so many of the human race. This shows most often in arterial changes, one of the earliest symptoms of which is alteration in blood tension. The tension of the blood-vessels in health is maintained at an even point through the action of the unstriped muscular tissue in the walls of the blood-vessesls. The heart is a part of the

circulatory tubes, and differs only in arrangement and degree from the mechanism of the rest of the circulatory path. It contains unstriped muscular fiber as do the blood-vessels, and an arrangement of valves as do the veins. Its muscular action is rhythmic, while the muscular action of the blood-vessels is only slightly so. Both are subject to the control of the nervous system. It is in the disordered action of all these muscles that the first signs of degeneration appear. The muscles in the vessels act badly, the muscle in the heart is irritated, and the result is tension. To apply vaso-dilators without also instituting hygienic measures to reduce the irritability of the heart and restore the disordered or exhausted nervous system, is to overlook an important element in the problem of cure.

The necessity for the use of vaso-dilators is diminished in proportion to the intelligence and success attending these accessory measures. In Bright's disease there is probably some substance circulating in the blood that demands a high pressure for its elimination. This, with the physio-

logic attempt of the heart to carry on the circulation, again brings about high-tension. When high-tension antedates the onset of nephritis it may well be supposed that the tension has something to do with the production of nephritis.

A physiologic increase of blood-pressure is caused whenever there is nervous, muscular, or physiologic exertion.

Prolonged nervous strain, such as that met with in an exciting business career, or in prolonged dissipation, keeps up a tendency to tension that is particularly apt to lead to arterial degeneration. Muscular action is less prone to produce damage, and probably does so only in rare instances of long training and severe contests of strength. The reason for this is that exercise is accompanied by natural dilatation of the arterial circulation, improved nutrition, and relief afforded by perspiration. The physiologic activities of the body are usually accompanied by too slight a stimulation of the circulation to count for much in health, but are worth considering in disease.

In the case of a person suffering from ab-

normal tension it is especially important to do away with mental strain and responsibility. Such a person should not indulge in violent exercise, but is benefited by slow exercise. Food should be moderate in amount, taken at frequent intervals. Sugar and alcohol should be done away with entirely if possible, and meat used only in limited amount.

When the vaso-dilators are given it is to produce a definite physiologic effect which is capable of being appreciated by the observer. The dose required to produce this effect differs widely in different individuals and under different circumstances. In a large number of cases they are now so given that no effect whatever is produced. Crude therapeutic thought is responsible for this. The idea is conceived that the nitrites are good for kidney- and heart-disease, and so they are administered with the hope that the patient may be benefited thereby. If improvement takes place the medicine receives the credit, whether it has done its work or not. The word "conservatism" means more than caution, more than small dosage. It means the working out of the possibilities of

the remedy and its application in such a way as to fulfil its broadest mission, so that it may not be wasted or abused—wasted when used in non-active doses, and abused when used too often, or in too great quantity. With the vaso-dilators a careful regulation of the dose is of vital importance, for their final action may be dilatation and paralysis of the heart through a complete breaking down of that great power called inhibition which moderates all muscular activity.

When nitrites are used it is also of the utmost importance that the preparation selected should be reliable. I have known patients to take for a long time tablets supposed to be nitroglycerine which were subsequently found to be inert. When no benefit is obtained in conditions in which nitroglycerine is clearly indicated this may be fairly suspected. As a test, one of the tablets should be given to a healthy person, who should immediately feel the throbbing in the head due to the dilated blood-vessels and the stimulation of the heart. If no effect is felt, a new preparation must be sought and this tested. The 1 per cent. solution of glonoin is probably

more reliable, but is not nearly so convenient for patients as the tablet.

Cases must be studied from time to time by the withdrawal of these drugs, and by the substitution of other drugs of a different class. Particularly is it important in every such case to know from actual observation the effect of digitalis in such doses as bring about distinct physiologic phenomena.

But few diseases can be treated by specific measures, and cardiovascular disease is particularly remote from such an ideal. The end which drugs accomplish is to so control the circulation as to tend to benefit the condition of the tissues, or to prevent the condition of these tissues from working injury to the body as a whole. The management of cardiovascular disease is like the running of an intricate machine. The physician must study the machine itself and learn all its resources. He must know the use of every tool, and the effect of the turning of each screw. It is no abuse of the privileges of the physician to study his cases therapeutically by testing from time to time the effect of different classes of drugs,

though he return after each trial to the original plan of treatment. It is the height of arrogance to assume that his inductive reasoning can plan for each case a permanent course of management. Such action will only lead to humiliation and disappointment. How exasperating it is when for a long period of time, on theoretic grounds, we have abstained from the use of such a drug as digitalis to find some time or other that our patient has taken it through the advice of the corner druggist and has received appreciable benefit from it. Of course, we know very well that the corner druggist had no right to experiment, but perhaps the risk was worth taking after all.

There is a particular form of pulse in which nitroglycerine is not as valuable as a number of other drugs. This is a high-tension pulse with persistently rapid heart-action. In these cases I have sometimes seen the greatest benefit from the use of digitalis. Nitroglycerine has a twofold action in stimulating the heart and dilating the blood-vessels. Digitalis has a twofold action in slowing the heart and contracting the blood-vessels. Theoretically digitalis

would not act in these cases, but practically in a case of nephritis with a high-tension and rapid pulse, digitalis will often show its controlling action upon the heart in greater degree than any of its other effects, and in that way bring about a slower pulse with less apparent tension. At the same time digitalis will clear up congestion of the kidneys and cause a better secretion of urine.

Even when tension does exist in cardiovascular disease with nephritis, it should be realized that some tension may be desirable. As time goes on in such a case, the greatest danger to be feared is a too great lowering of the blood tension with its accompanying congestions and effusions. In the presence of symptoms indicating disturbances of cerebral circulation, such as numbness or awkwardness of one of the extremities, or slight difficulty in speech, the vaso-dilators are imperatively needed. Sodium iodid has also an undoubted power to postpone paralytic attacks due to the plugging of blood-vessels.

A word as to the possibility of recovery from cardiovascular degenerative disease. The heart

symptoms are those of myocarditis, and the kidney symptoms those of chronic nephritis. The tendency of the blood is to become of poor quality. With a properly planned regimen and the possibility of carrying it out, and with careful medication and other therapeutic measures, the heart may recover its tone so that all symptoms of degeneration will disappear, and the kidneys may settle down to do their work according to a particular plan, but well enough for the maintenance of health.

It is hard to prove the regeneration of kidney tissue, though the physiologic hypertrophy of one kidney when the other is removed leads to a belief in its possibility. Certainly there are many persons passing a large quantity of urine of low specific gravity, and with a slight trace of albumin, who maintain year in and year out signs of health. Their hearts, blood-vessels, and kidneys have readjusted themselves, and though bearing the scars of disease are carrying on the functions of the body in a satisfactory manner. I have pictured this condition because it is extremely interesting to decide in these cases how much

we should intervene with drugs to alter the heart-action or relax the blood-vessels. It seems to me that in the absence of symptoms sodium iodid will accomplish the best purpose, and that the use of the nitrites should be limited.

The hypertonicity of the arteries found as a part of nature's attempt to compensate for a failing heart muscle and present in many cases of secondary low blood-pressure must be distinguished from high blood-pressure. The contraction of the arteries disappears upon the recovery of the power of the heart to fill them with blood. Blood pressure in man must be estimated by the physician and does not correspond in all cases with the reading of the sphygmomanometer.

CHAPTER X

THE BLOOD-VESSEL TONE-MAINTAINING FUNCTION OF THE BRAIN

The maintenance of tone in the muscular coats of the blood-vessels is so essential to the continuance of life and health that, when it fails, death follows in a very few moments. The capacity of the hollow organs that contain the blood, when completely relaxed, is so great that the blood in the body can only fill them to the extent of one-third. It is evident that the complex movements of the blood, constituting the circulation, cannot be carried on in a system of tubes that are only one-third filled. The circulation is, therefore, dependent not only upon the muscular contractions of the heart, but also those of the blood-vessels. In the course of evolution from the lower to the higher animals, there is found in the earlier stages a simple tube, and this gradually be-

comes more and more changed until in its course there are developed special collections of muscles, known as hearts, and when we get to the higher animals we find the greatly differentiated single organ, as in man.

So, while, of course, in man the heart is relatively of great importance, still the muscles that remain in the blood-vessels are absolutely essential to the maintenance of the circulation. In the control of the muscles of the heart and blood-vessels there comes into play a complex arrangement of nerves and nerve centers that is only secondary in its awe-inspiring perfection to the machinery of the intellect itself.

As we trace the development of the circulation from the lower forms of life up through the scale, we find that the control moves closer and closer to the central nervous system. In the higher forms of animals a tone-maintaining function is easily traced to the medulla, and the author believes that in man, at least, an important part of this function is found in the cerebral hemispheres.

It is well known that there is a tone-maintaining influence originating in the motor areas

of the brain that presides over the tonicity of the voluntary muscles. When a stroke of paralysis occurs, due to damage to the part of the brain that presides over the motion of a limb, that limb is paralyzed with regard to voluntary motion, but at the same time there occurs a relaxation, a loss of tone, in the blood-vessels that causes swelling. This suggests the fact that the involuntary muscles were likewise involved in a loss of tone, and would seem strong evidence of this blood-vessel tone-maintaining function. Not only may local blood-vessel tone be affected by changes that occur in the brain, but also the general tonicity of the whole circulatory system. In all brain conditions we look for changes in the peripheral circulation. Emotion may cause a rapid rise of blood-pressure. It is said that insane asylums are full of high-pressure cases due to cerebral excitement. In cerebral neurasthenia the blood-pressure is apt to be low.

In advocating the recognition of a blood-vessel tone-maintaining function of the brain it is not necessary to minimize the importance of the center in the medulla, whose activities in this

direction are so well known. It is only necessary to believe that the activity of this center is dependent upon stimulation received from the brain. A recognition of this function of the brain, which exercises a general control over a vessel tone, and therefore over blood-pressure, makes it much easier to understand many important disorders of the circulation and the benefits of certain plans of treatment experience has proved of the greatest value.

It explains why exercise of the voluntary muscles has so good an influence over disorders of the tone of the involuntary muscles. It makes clear why resistance exercises have vindicated their right to a place in the treatment of disease of the heart. It also reveals the development and points the way to treatment of a disease, the importance of which is becoming more and more recognized every day, and which we will discuss in the next chapter,—Hypertonia Vasorum Idiopathica.

CHAPTER XI

HYPERTONIA VASORUM IDIOPATHICA

THIS is *par excellence* the disease of the present day, and is looming up as of more and more importance in proportion as it is better understood. The time cannot be remembered when successful men were not stricken down in the midst of their activities by apoplexy or so-called heart failure. Of late years, it is increasingly common for those men and women who play the most prominent part in the world, and carry the heaviest burden of responsibility, to develop finally disorders of the arteries of the brain or of other vital organs, resulting on the one hand in apoplexy, or on the other in Bright's disease. We have attributed these breakdowns too often to chemical causes arising from disorders of the digestive system, or we have regarded them as primarily disease of

the kidney, developing in some mysterious way. Too often has alcohol been blamed when in reality it was hardly a factor in the case. Why should it be that persons preëminent for the use of their brains, and singled out for the heaviest responsibilities, suffer in the direction of the circulation so much more than those whose occupation is of another character? The reason is to be found in the effect of mental strain in exaggerating that tone-maintaining function of the brain that was discussed in the previous chapter.

Let us trace the development of such a case, resulting in an attack of apoplexy. A composite picture, drawn from the mental concept of this disease, tallies almost line by line with many concrete examples. The patient is a man of good family history, inheriting sturdy qualities from an ancestry that has developed strength through the successful contest with the difficulties of the development of a new country. He has been well educated, and has led a healthy and active youth. From the very beginning he has been a worker among his fellows, and spurred on by one success after

another, by middle life he has attained a position of importance and usefulness. Now his qualities have been recognized, and one burden after another has been laid upon him. He has become a factor in government, in business, in intellectual pursuits, and in philanthropy. Such a man, unmindful of the fact that he is past middle age, and that the body no longer has the recuperative power of youth, continues his work unceasingly, without those relaxations that attract men of a lighter turn of mind. The man feels perfectly well, but a change has taken place in the machinery of his body. The influence from the central nervous system, which maintains the blood-vessels in a proper state of tonicity, has become exaggerated through the overflowing of the mind strain, and the blood no longer circulates with ease. Now it is hard for the heart to keep the blood in proper circulation, but without any manifest symptoms it becomes enlarged and still carries on the work. The two factors of arterial contraction and cardiac hyperactivity result in high arterial tension. This in turn results in structural damage to the blood-vessels

in the brain, the kidneys and elsewhere. Unconsciously, the man is living in constant danger. Some day there arises some incident in the man's career that leads to an unusual degree of worry or mental strain, and there develops a tendency to inflammation in the already damaged blood-vessels of the brain, and the blood clots and stops the circulation, most likely in the speech center on the left side, and another prominent man has fallen victim to an attack of apoplexy. Sometimes the picture is varied and one of the arteries that supply the heart substance with blood is stopped, and the man drops dead in his tracks; or in another case the kidneys gradually give out. Not infrequently the abdominal arteries show the first indications by terrific digestive disturbance causing great distention of the stomach with wind and marked irregularity of the heart. This is my mental concept of hypertonia vasorum.

Even after any one of these serious accidents much can be done for a man made of such good stuff, but how much more satisfactory would be the prevention of such an

accident by proper medical treatment and a suitable regimen.

I would like to register a protest against those who decry the use of drugs in circulatory disease, because in all medicine there is no condition in which proper drug treatment is of greater value, and none in which, to my mind, its usefulness seems more easily demonstrated. The remedies must, however, be used with appreciation of the fact that they are to regulate an active mechanism that is always changing in its demands, and that the one needed at one time may be contraindicated a little later.

This implies very careful medical supervision, particularly when the case first comes under treatment. By a process of re-education of physiological processes control of function becomes easier and easier, and as the patient becomes familiar with his tendencies, the physician can in a measure yield control. The details of treatment must be worked out for each individual with due regard to the relation of blood-pressure, heart disease and blood-vessel damage.

PART II

THE NAUHEIM-SCHOTT TREATMENT

CHAPTER I

THE LOCATION AND HISTORY OF NAUHEIM AND THE DEVELOPMENT OF ITS SPECIAL FORM OF TREATMENT

BAD-NAUHEIM is a little town in Hess, situated on the northeastern slope of the Taunus range of hills, about forty-five minutes' ride from Frankfort-on-the-Main. Its elevation is 144 meters (460 feet) above sea level, and the average temperature for the year is about 46 Fahrenheit. The place has been occupied by valuable salt works for several centuries, and it is quite possible that the waters there were used for therapeutic purposes long before the times of which we have historical data. In the beginning of the last century the Bath was quite popular as a resort for the treatment of rheumatism and of kindred affections, and in 1835 the first bathing house was constructed there. The statistics of visitors to the Bath show that in

that year ninety-five persons availed themselves of the treatment, 2364 baths having been given. For many years afterward the number of visitors steadily increased, special success having been found to attend the treatment of gout and chronic rheumatic affections by means of the baths. In the year 1857 a Dr. Beneke, at that time an instructor in the neighboring University of Marburg, was sent to Nauheim for the summer season, and immediately occupied himself with scientifically conducted observations of the effects of treatment at the Bath.

Before this time the existence of cardiovascular disease was considered a strong contraindication to the use of Nauheim baths and the few "heart patients" present at Nauheim were mostly suffering from valvular affections of the heart brought on by repeated attacks of rheumatism; in these cases, it sometimes seemed that the treatment of the rheumatism was called for in spite of the contraindication found in the condition of the heart. It is such patients that especially interested Beneke, and the result of his studies

was the publication of an essay upon Nauheim Baths in relation to Heart Disease.

In the following decade Beneke continued to defend the use of Nauheim Baths in the treatment of heart disease, publishing from time to time reports of a number of cases observed by him which were benefited by the supposedly dangerous saline baths. His works are well worth the attention of physicians who are interested in the development of the Nauheim treatment; Beneke was a good pathologist, and a successful teacher at the University of Marburg, and he is accurate as well as moderate in his accounts of the effects of the baths.

About this time a neglected statement of the brilliant Stokes, referring to the beneficial effect of moderate exercise in heart disease, was developed by Oertel, who invented the method of treating such disease by having the patient walk a certain distance each day upon carefully laid out paths with graded ascents. The general interest in the treatment of cardiac disease by hydrotherapeutic and gymnastic measures was much aroused and Bad-Nauheim

began to attract a great many more patients suffering from cardiovascular disease as well as able physicians who continued the studies begun by Beneke. Of these, Drs. August and Theodore Schott have contributed most to the development of the balneological treatment of cardiovascular disease, having added a system of gymnastic therapeutics to the treatment by means of saline and effervescent baths, which now form such an important part of the method of treatment that goes under their name. Their work included a series of experimental studies in the effects produced upon the blood pressure of animals by the immersion in saline solutions of various strengths; there was unmistakable evidence that such immersion had a very marked modifying affect upon the blood pressure, thus answering the objections of many who pointed out the seeming absurdity of trying to affect the circulatory system through the non-absorbing skin. Between 1880 and 1890 the Drs. Schott published a number of papers detailing the results of their experimental studies and the application of these results to the treatment of cardiovascular

disease in human beings; at that time, too, they took up the forgotten suggestions of Stokes and adapted the well known Swedish system of gymnastics to the requirements of treatment of cardiovascular conditions. The final result was the evolution of the combined bath and gymnastic treatment—the Nauheim-Schott treatment—the separate elements of which we shall consider in the succeeding chapters.

Before entering, however, upon the specific traits that characterize the treatment of cardiovascular disease at Bad-Nauheim, as developed by Drs. August and Theodore Schott, we shall devote this chapter to the general question of the "Kurort" treatment of special affections, that is so popular in Germany. One frequently hears many objections to the segregation of patients in a small town, all suffering from similar affections, and ready to spend their leisure time by talking and listening to each other's complaints; this is, indeed, a serious objection to the sanatorial treatment of disease which has of late become quite popular in Anglo-Saxon countries. But the whole dif-

ference between such treatment and the cures carried out in German watering places consists in almost total absence of the surroundings of sanatorial life.

Bad-Nauheim, for example, is a summer resort of the first order, as well as a vast sanatorium for the treatment of heart disease, and its visitors are "guests" and not patients in the narrow sense of that term. The governmental control of the watering places in Germany has easily led to the limitation of specific sanatorial atmosphere in such places, the grounds, buildings, walks, amusement places, etc., having been constructed with a single aim in view, that of attracting and keeping the greatest number of "guests" during the season, while furnishing all the means for the scientific and well-regulated treatment of disease.

We have spoken of the prevalence of cardiovascular breakdown in the present day, and it is probable that the reasons for such frequency are to be looked for, not merely in the increase of the gross causes of heart and blood vessel disease, but in a thousand and one little details

of modern life that predispose to the phenomenon in question.

Granting the existence of such subtle influences, making for the increase of a certain type of disease, we must also grant that the cure of disease, as distinguished from mere treatment, often depends likewise upon a thousand and one details surrounding the patient at the time. This is where the advantage of the "resort treatment" of disease is best felt. The cure, as it is carried out at Nauheim, for instance, provides for these numerous details of treatment, consisting in the opportunity for rest, relaxation, freedom from worry, etc., the absence of which during treatment carried out amidst the usual surroundings of life at home, with the business interests and worries ever present, forms an important factor in the slower rate with which such cure progresses. That such "home treatment" is nevertheless a valuable means of curing cardiovascular disease is, of course, self-evident; it is no less true, however, that there is room in America for the construction of resorts for the special treatment of cardiovascular disease along the

lines of treatment at Bad-Nauheim, which would simplify the matter of managing such patients very much.

Having given due consideration to the name to be used for the treatment I am about to describe, I cannot but agree with the sentence on page 163 of the book on "Cardiac Failure and Its Treatment," by Alexander Morison, M. D., Edin., F. R. C. P., Ed.

"But whether the diminution of the area of cardiac dulness will be shown to result from change of *size* or change of *position* of the heart, or from both these causes, in those cases in which it is noted, the fact one way or another will neither add much to nor detract much from the general interest of August Schott's labours in this field of enquiry; and, objectionable as a patronymic nomenclature usually is in medicine, in the eternal course of which the coming and going of units is only temporarily interesting except to the antiquary of a later age, one cannot grudge that the work of one of so much promise, and so early dead, should be perpetuated by having his name coupled with it."

CHAPTER II

DESCRIPTION OF THE NAUHEIM-SCHOTT TREATMENT

In the preceding chapter we have briefly acquainted the reader with the geographical and climatological advantages of Bad-Nauheim as a resort for the treatment of diseases in general. What we are especially interested in, however, is the treatment of cardiovascular disease, and in the present chapter we shall give an account of Bad-Nauheim from this standpoint.

The treatment at Nauheim may be classified under three sub-headings: baths, exercises, mineral springs. While the baths form the essential part of the Nauheim-Schott treatment, the exercises are no less important; drinking of mineral waters is simply an advantage that can be utilized in case symptoms are present that indicate their uses.

We shall first consider the facilities to be found at Nauheim for carrying on the balneological treatment of circulatory disorders. The most important of these is, of course, the presence of springs that are richly charged with carbonic acid gas and at the same time have an abundant saline content. The springs which are used for bathing purposes are four in number; the great Sprudel (No. 7), the Friedrich Wilhelm Sprudel (No. 12), and the Nos. 11 and 14, the latter having been bored but a short time ago. The accompanying table of the quantitive analysis of the Nauheim waters shows the composition of the water in the several springs. These different waters allow a nice gradation of baths from such as furnish but a slight amount of stimulation required in the beginning of treatment to the powerful stimulating baths used at the end.

Four different varieties of baths are employed: 1, plain saline baths. These are given in a special bathing house, the water being allowed to flow freely over so-called "graduation works," where it loses all of the free carbonic acid gas it contains. In addition it parts

ANALYSIS OF THE SPRINGS USED FOR THE BATHS

(Made at the Grand-ducal Hessian institute for chemical examination at Darmstadt during the years 1903 and 1904.)
The amounts of solids are given in grammes as contained in 1000 grms. of water.

Constituent parts.	No. 7 Grosser Sprudel	No. 12 Friedrich Wilhelm-Sprudel	No. 14 Ernst Ludwig-Sprudel
Chloride of Sodium . . .	19,5402	27,1525	22,7090
Bromide of Sodium . . .	0,0090	0,0122	0,0170
Chloride of Potassium . .	0,5953	0,8381	0,6436
Chloride of Lithium .	0,0560	0,0626	0,0405
Chloride of Ammonium .	0,0508	0,0575	0,0753
Chloride of Calcium . .	1,3643	2,7619	2,4493
Chloride of Magnesium .	0,3948	0,5281	0,4663
Sulphate of Potassium .	0,0652	0,0818	0,0787
Bicarbonate of Calcium .	2,4894	1,7953	1,6019
Bicarbonate of Strontium	0,0302	0,0500	0,0456
Bicarbonate of Iron . .	0,0218	0,0289	0,0309
Bicarbonate of Manganese	0,0063	0,0052	0,0041
Phosphate of Sodium . .	0,0004	0,0004	0,0005
Arseniate of Sodium . .	0,0009	0,0007	0,0008
Silicic Acid	0,0164	0,0194	0,0173
Amount of solid constituents	24,6410	33,3946	28,1808
Absolutely free carbonic-acid gas	3,9634 = 2277 ccm.	3,3118 = 1931 ccm.	2,9630 = 1715 ccm.
Amount of all constituent parts	28,6044	36,7064	31,1438
Temperature { Celsius .	29,9°	34,4°	32,2°
Temperature { Fahrenheit	85,8°	93,9°	90,0°

(This table is copied from Dr. J. M. Groedel's Bad-Nauheim, Ed. 1907.)

with a great deal of the warmth possessed by it as it streams from its subterranean sources. The water as it finally enters the baths contains almost exclusively compounds of chlorine and of bromine in solution, and exercises the usual effects of a brine bath, such as can be duplicated anywhere by the addition of sea salt or even coarse commercial salt to the water used for the purposes of bathing. These baths, however, form a very good initial stage of treatment, and in case of necessity, their effect may be enhanced by the addition of so-called "mutterlauge," or the uncrystalizable waste product of the neighboring salt works. According to Dr. Theodore Schott the Nauheim "mutterlauge" differs from that obtained in other localities by its large content of chloride of calcium, which acts much more intensely upon the skin than other compounds of chlorine. By means of gradually increasing the amount of mutterlauge added to the saline water of the springs, these baths may be had from the very weak to the very strong, in their action upon the skin thus meeting all possible indications.

The second form of bath used in Nauheim is generally called the thermal saline bath, but Professor Schott very correctly points out that the adjective thermal does not apply to this form of bathing. The water for them is again derived of course from the springs, but it is collected in large open reservoirs where it is exposed to the air for a long time. It is evident that any natural warmth possessed by the water of the springs is lost while it is kept in these reservoirs, and the bath as finally given has the temperature of the surrounding atmosphere, unless, of course, it has been artificially warmed or cooled. A more important change that takes place in the water while in the reservoirs is the loss of a great deal of the free carbonic acid gas which the spring water contains. The immediate result of this is the precipitation of a greater part of the saline compounds which were kept in solution by the carbonic acid; these baths are readily recognized by the reddish grey tinge which the water assumes because of such precipitation. This form of bath, therefore, has a certain amount of saline action, but what is more important, it intro-

duces the essential element of the Nauheim waters, the effect of carbonic acid gas. Again it is self-evident that the partial loss of the carbonic acid gas while in the reservoirs renders the water prepared in this manner the next gradual step in the treatment of circulatory disorders.

We now come to the so-called effervescent baths (Sprudelbad), the waters for which are conducted in subterranean pipes so that the contact with the atmosphere and the consequent loss of carbonic acid gas is surely avoided. The temperature of the water, too, is kept at about the same point as that of the spring, and the bath is correctly called the effervescent thermal bath. The fact that the carbonic acid gas is kept in solution in this water is evidenced, in the first place, by the brilliantly clear character of the water, no precipitation of salts taking place; secondly, by the innumerable bubbles of gas that quickly cover the skin of the bather; these bubbles disappear, only to be replaced by new ones, which phenomenon may be observed to take place several times during the ordinary course of the

bath, until the excess of carbonic acid has escaped.

The final form of baths at Nauheim is the so-called current thermal bath, which may be composed of the water rich in brine alone, or of the effervescent water considered in the last paragraph. The water is made to enter and leave the bath tubs under pressure which adds to the two factors, the action of the salines and the action of the carbonic acid gas, a third one still, namely, the physical effect of water in motion. The amount of pressure used is different in the different springs, so that a gradation of this factor of treatment is also possible.

All these means are at the disposal of the Nauheim physicians, and the reader will readily see that there are a number of gradations possible in their use so as to meet any indications present in the individual case. The great service for the proper treatment of heart and arterial disease that has been done by the Nauheim physicians, beyond calling attention to the curative action of the springs in general, consists in working out these gradations; in a word, in individualizing the patients that come

to Bad-Nauheim for treatment. One often hears of the harm that the effervescent thermal baths have done in this and that case of cardio-vascular disease, and it is true that much harm has been done in this fashion. The trouble, however, has not been with the treatment *per se*, its principles being sound, but in the false application of the treatment, which may conveniently be compared to insufficient or over-sufficient dosage in the treatment of disease by drugs. The warning may not be out of place then, that "heart patients," as the Germans call them, should take all possible care in putting themselves in the hands of persons who profess to use Nauheim methods of treatment. Many unscrupulous masseurs and former attendants at Nauheim may be found who claim to use the treatment wherever carbonic acid gas may be had for modifying the water used for the purposes of bathing. At Nauheim the public is, of course, protected from such imposters, but elsewhere, and especially in America, patients must be sure of obtaining competent medical advice before undergoing a course of treatment. In a future

chapter we shall treat of the applicability of Nauheim methods in the general hospitals and at the homes of the patients, and these preliminary words may prepare the reader for proper understanding of the discussion that will follow.

We shall not go into details in the use of the means of treatment described above, because of our belief already stated that no hard-and-fast rules are possible in arranging the course baths as far as the character, duration, and temperature is concerned. *These factors must meet the indication found in each individual case.* In general, however, the temperature ranges from 95 F., to 80 F., and in exceptional cases the addition of ice may be used to lower it still further. The duration of the baths varies from an immersion of from three to five minutes, usually prescribed at the beginning of treatment, to twenty minutes at the end, which limit is but rarely exceeded. Usually a day of rest follows two or three baths on as many successive days. After each bath, rest for at least an hour is enjoined, the patient being quickly dried by means of heated towels and

then wrapped in heated sheets. The attendants must be allowed to perform these functions, so that the patient may be assured of absolute rest after the baths.

Four mineral springs are to be found at Nauheim; two of them laxative salines containing carbonic acid gas, one is an alkaline spring, while the fourth contains iron and salts. Of the two springs with carbonated waters the Kurbrunnen contains 1½ per cent. of salt, while the Karlsbrunnen contains not quite 1 per cent. The waters of these springs are often used in combination, and, of course, do not differ in their action from effervescent saline waters elsewhere. The fact, however, that they are within reach to meet any special indication enhances the completeness of the treatment that is possible at Bad-Nauheim.

We shall not consider the explanations usually given to account for the effect of the baths upon the circulation; many theories have been proposed, all of them containing their elements of truth, but none fully accounting for the results that may be observed

in the living patient. The author has worked out his own explanation for the phenomena he has witnessed during a prolonged stay at Bad-Nauheim in the summer of 1908, and is glad to say that this explanation has for the most part met with the approval of Dr. Theodore Schott.

There remain for consideration the two additional means of treatment, the gymnastic exercises and the mineral springs. The exercises are an all-important part of the treatment and are, perhaps, the one factor that may most readily be misused because of lack of proper training in the physician for directing them and in the attendant for helping the patient to carry them out. The author was very much impressed with these facts while at Nauheim, and has, therefore, endeavored to make the usual direction for exercises much clearer for his readers by obtaining a series of photographs of the movements. Two expert attendants posed for the pictures, the advantage of this consisting in the fact that the patient no less than the operator must know how to act in order to insure the success of the exer-

cises, and the trained attendant was the best subject to pose as a patient.

We shall now turn to the consideration of the resistance exercises introduced by Drs. Augustus and Theodore Schott, and shall then quote some illustrative cases observed by writers in the subject and by the author personally while at Nauheim; the careful perusal of these may fix in the mind of the reader the indications for the baths and the results of them better than any formal statements of the author.

RESISTANCE EXERCISES

The design of these exercises is to strengthen the heart muscle and to promote the even flow of blood through the vessels. They must be without fatigue and with but little exertion, and to obtain the result every movement must be executed slowly against a uniform resistance. Each movement is to call into play a different group of muscles and should be executed but once. An interval or rest should be given between each resistance movement. The patient should be watched closely for any indi-

cation of fatigue, such as increased rate of respiration, a sudden pallor of the cheeks or lips, evidence of palpitation, or, when the patient is standing, any apparent weakness in the limbs. Should any of these signs of distress appear the exercise should cease and the patient should be allowed to rest.

During the movements the patient should be instructed to breath slowly and regularly, and not to hold the breath, as there is a tendency to do even on the slightest exertion. The resistance is best applied as shown in the illustrations by the open hand. With these rules in view and with a careful study of each patient, limiting the number of movements to those that can be borne easily without fatigue, and adapting not only the different movements, but the resistance to each particular case, the exact "dosage" for each individual can be ascertained and the proper effect obtained.

The illustrations show the movements, and it is best to employ them in regular rotation, though certain patients that are good subjects for resistance exercises find it difficult to stand throughout a treatment, and

these can be commenced with by the resistance movements that can be given in the sitting posture. The patient is to be lightly clothed. The illustrations show the movements, but not the costume of the patient or operator.

It would seem that the chief benefit of the system of treatment can be traced to restoration of the normal tone of the heart and blood vessels. In its more indefinite form, there is nothing new in this idea in connection with Nauheim. Dr. A. Schott and the early writers taught that the system improved the strength of the heart and dilated the blood vessels. These were the facts that were observed, but a study of medical opinion on this subject would seem to show that the organic condition of the heart and blood vessels was always prominently in mind, and the existence of a definite normal tone of the involuntary muscles found in the heart and blood vessels was not sufficiently considered. The physiologic re-education that restores the proper activity of the musculature of the circulatory system, I believe to be the element of success in this treatment.

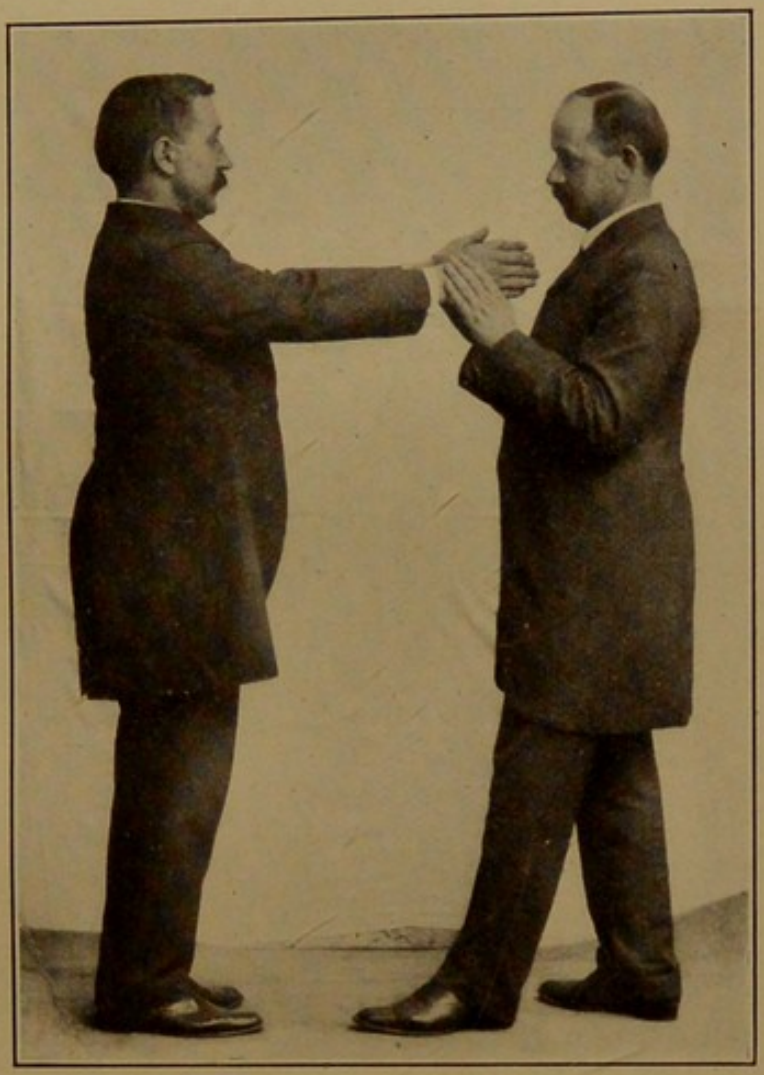

FIG. 3. MOVEMENT NO. I.—The arms are extended in front of the body at the level of the shoulders, the palms of the hands meeting. The operator places his hands on the outer surface of the patient's wrists allowing them to rest between the thumb and fore-finger. The patient is now instructed to carry his arms outward until they are in line with each other at right angles to his body. The operator resisting this movement with varying force as the case requires.

FIG. 4. MOVEMENT No. I.—This shows Movement No. 1, partly executed.

FIG. 5. MOVEMENT NO. I.—The operator then places his hands on the palmer surface of the patient's wrists with the thumb and forefinger in the same relative position and offers a slight resistance as the patient brings back the arms into the first position.

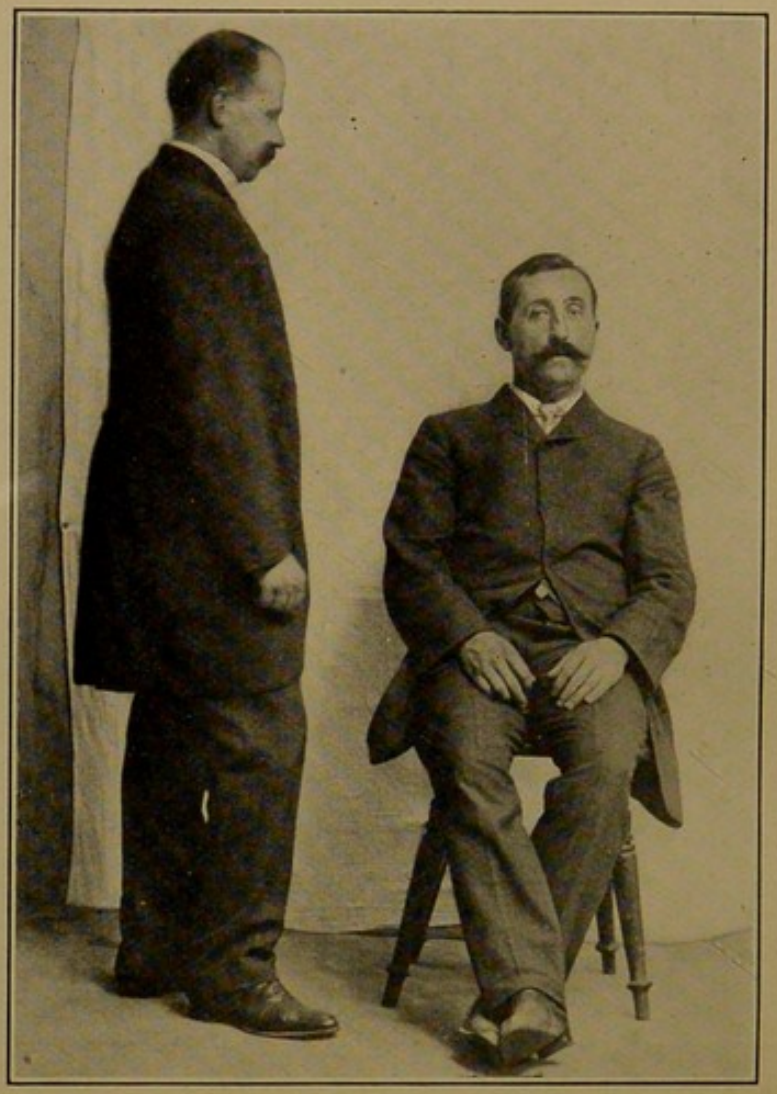

FIG. 6.—Patient rests between exercises and operator closely observes the effect of the resistance movements.

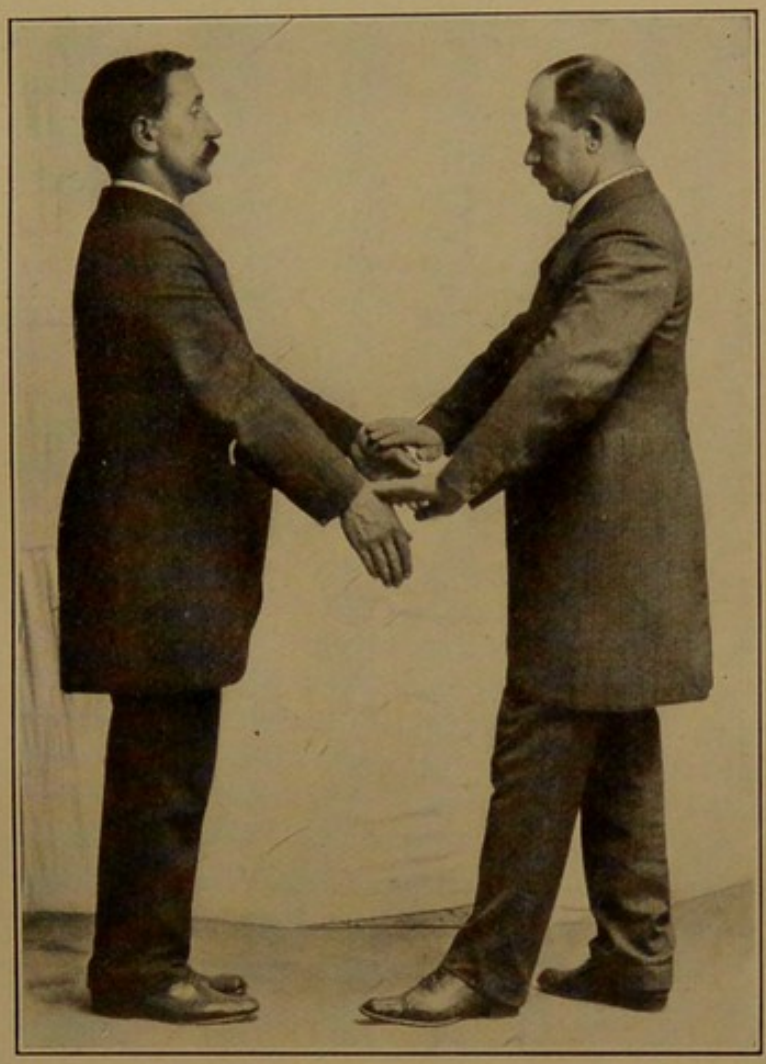

FIG. 7. MOVEMENT NO. II.—The operator standing in front of the patient places his hand on the ulnar side of the patient's wrists, and he is instructed to raise his arms in front while the movement is gently resisted. A corresponding downward movement is likewise resisted.

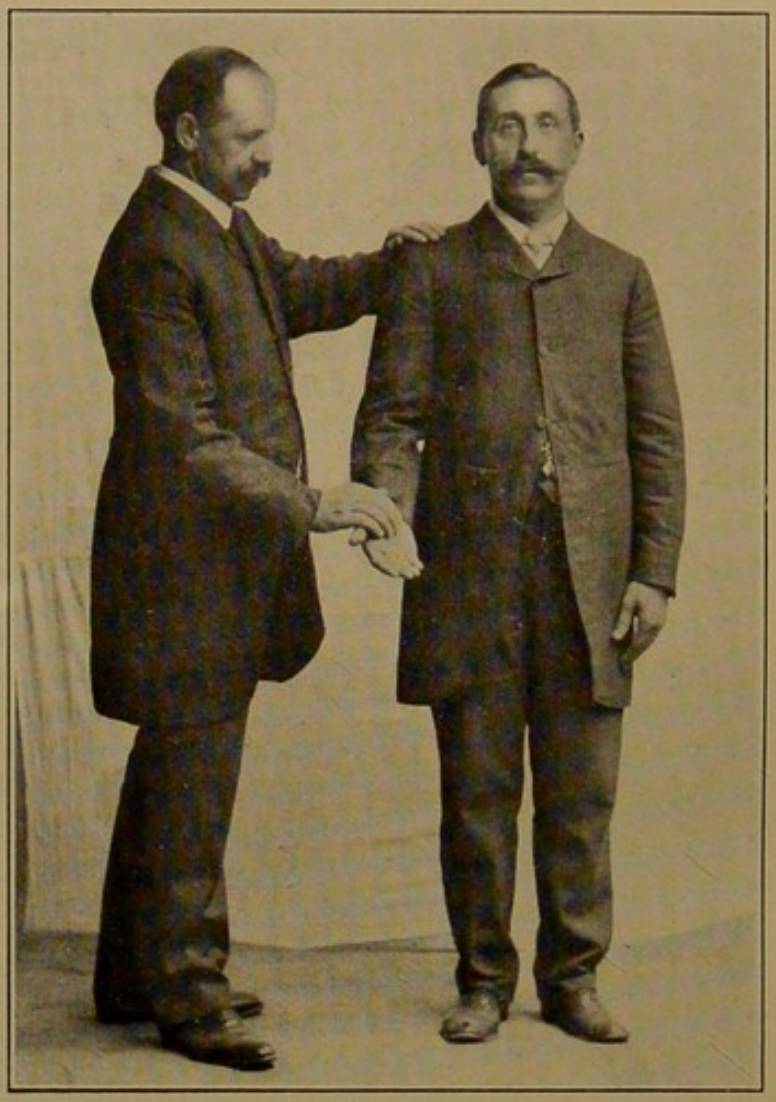

FIG. 8. MOVEMENT No. III.—The patient flexes his forearm without movement of the upper arm until the palm comes in contact with the shoulder. The operator then reverses his hand placing the palm on the dorsal surface of the wrist while the arm is being extended to the former position, in the meantime offering slight resistance.

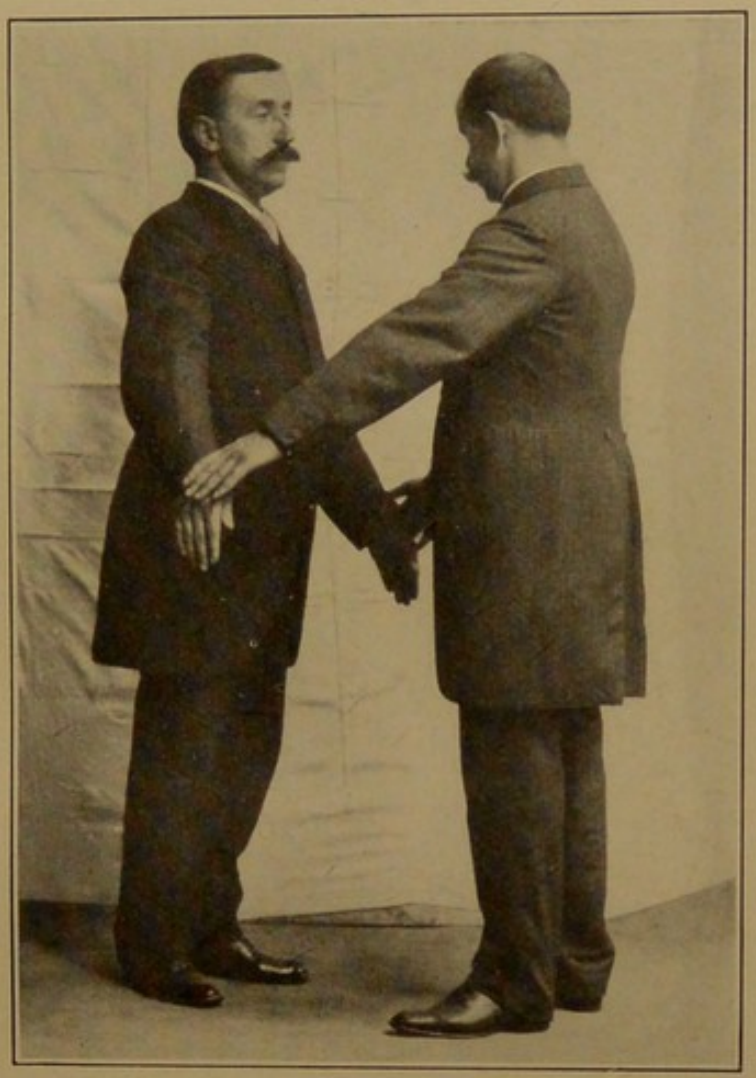

FIG. 9. MOVEMENT No. IV.—Both arms are extended vertically, the palm turned inward. The operator facing the patient with his hands on the radial side of the wrist. The patient is then instructed to raise his hands forward and upward until the thumbs meet overhead, the operator resisting the upward movement with his hands on the radial side of the wrist. Patient is then instructed to bring his arms back to the former position, and the resistance to the downward movement is obtained by the operator's hands on the ulnar side of the wrist.

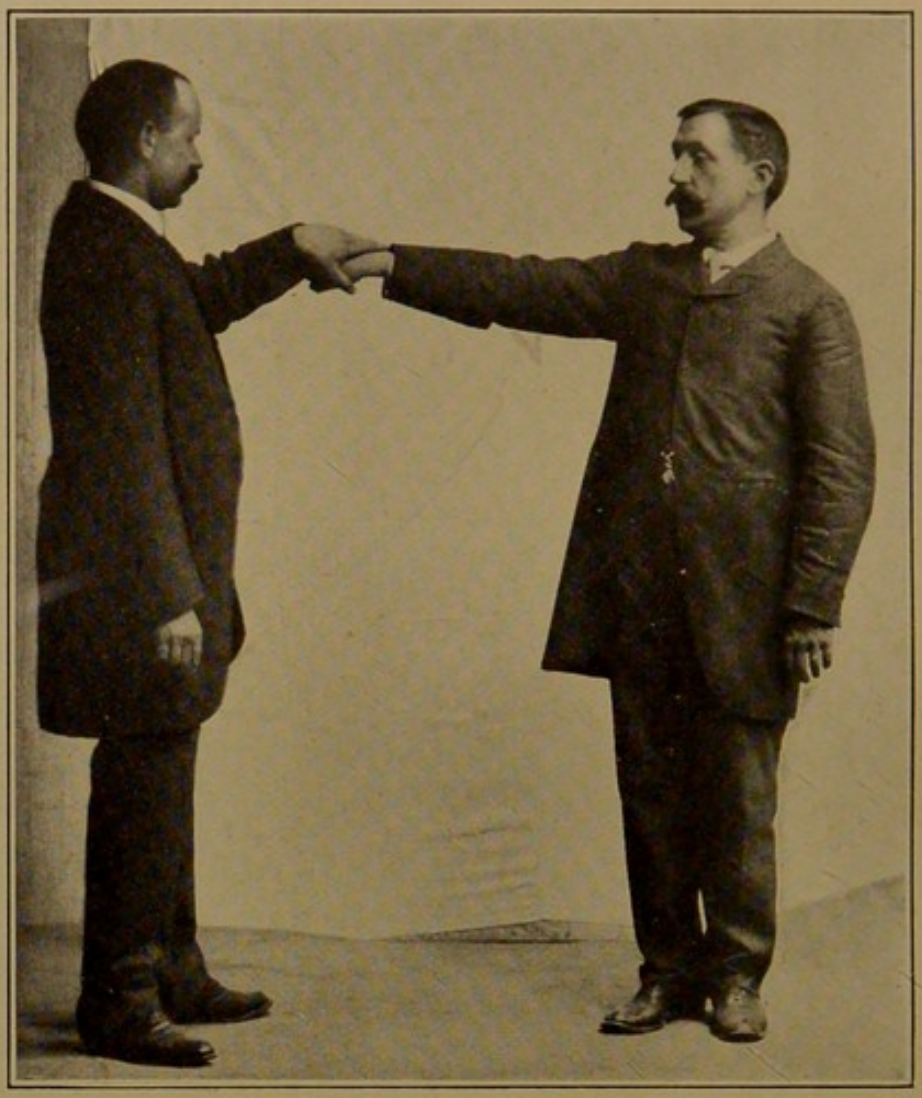

FIG. 10. MOVEMENT No. V.—The operator grasps the hand of the extended arm of the patient who slowly rotates the forearm in both directions while the movement is gently resisted.

FIG. 11. MOVEMENT NO. VI.—The arms are extended vertically in a dependent position, the palms against the thighs. The operator stands behind the patient and instructs him to move his arms backward and upward as far as possible, the upward movement being resisted with the fork of the hand on the ulnar side of the wrist. The movement is then reversed and resistance obtained by holding the hand on the radial surface of the wrist.

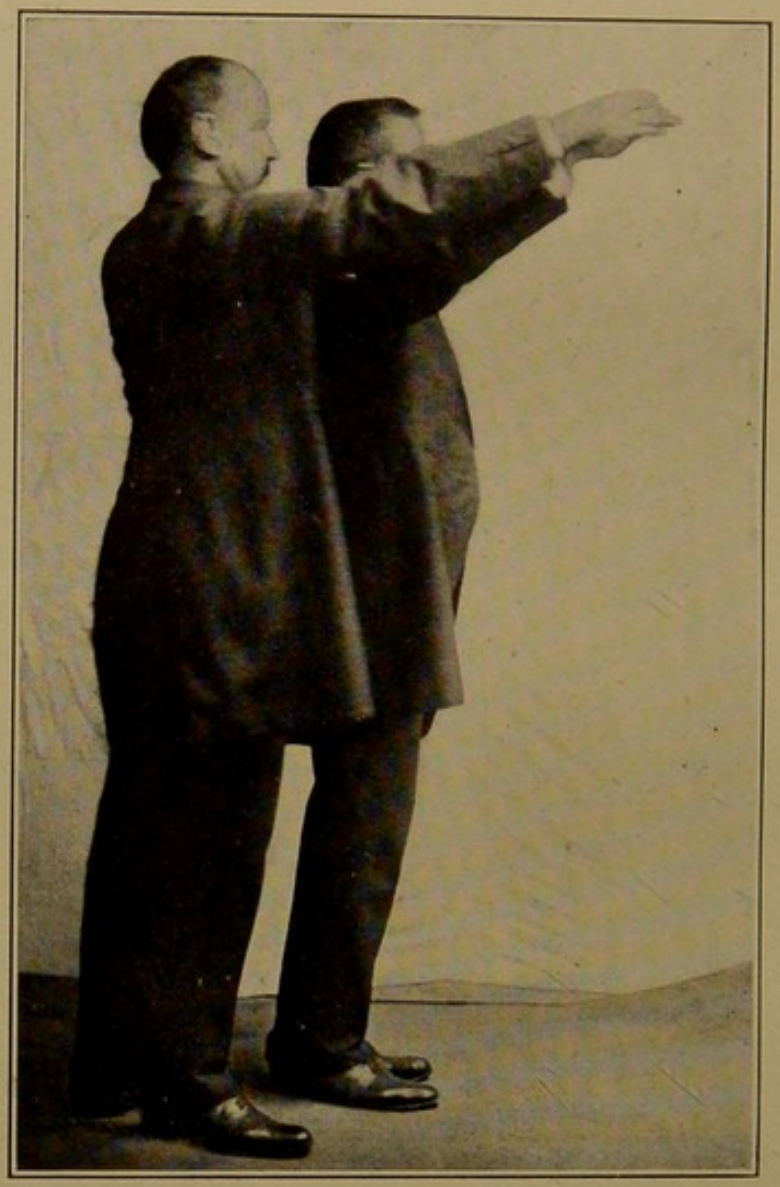

FIG. 12. MOVEMENT NO. VII.—The patient stands in front of the operator, and extends his arm forward the hand even with the shoulder. The operator from behind places his palm upon the dorsum of the hand. The patient is then instructed to raise his arm in a vertical position over his head, the operator offering resistance to the backward movement. This is repeated on the other side.

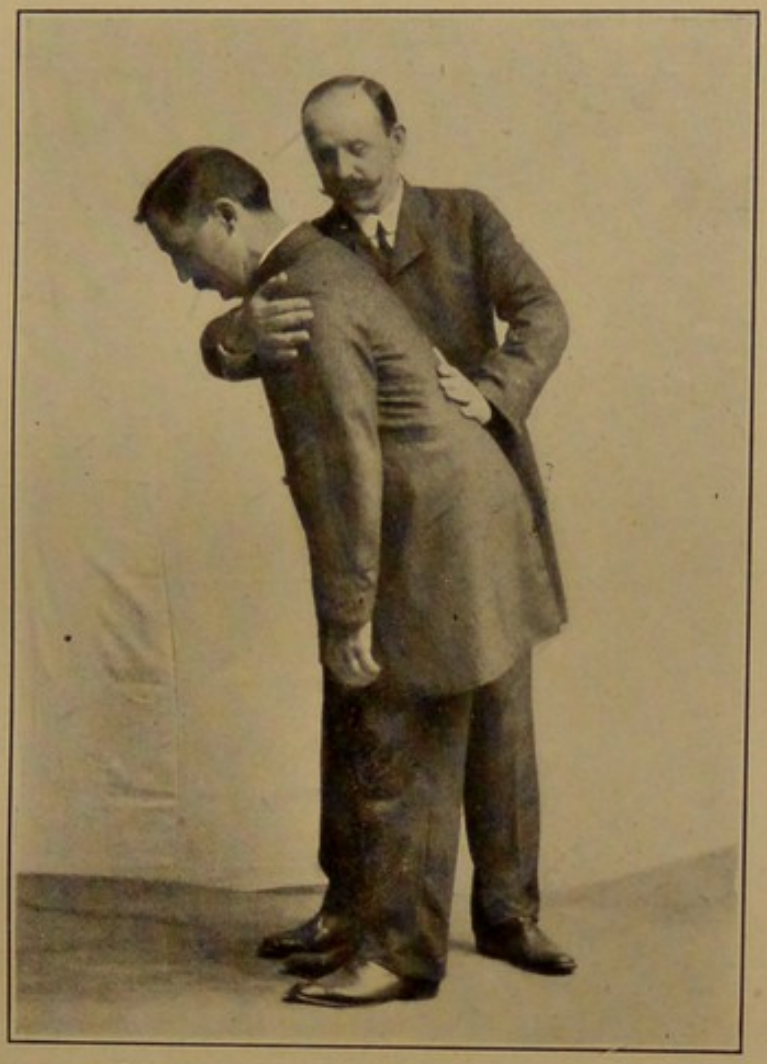

FIG. 13. MOVEMENT No. VIII.—The operator stands by the patient's side with one hand over the chest and the other over the lumbar region. The patient then is instructed to lean forward without bending the knees. The resistance is offered by the hand on the chest. The reversed movement, Fig. 14, is resisted by the operator placing his hand between the shoulders.

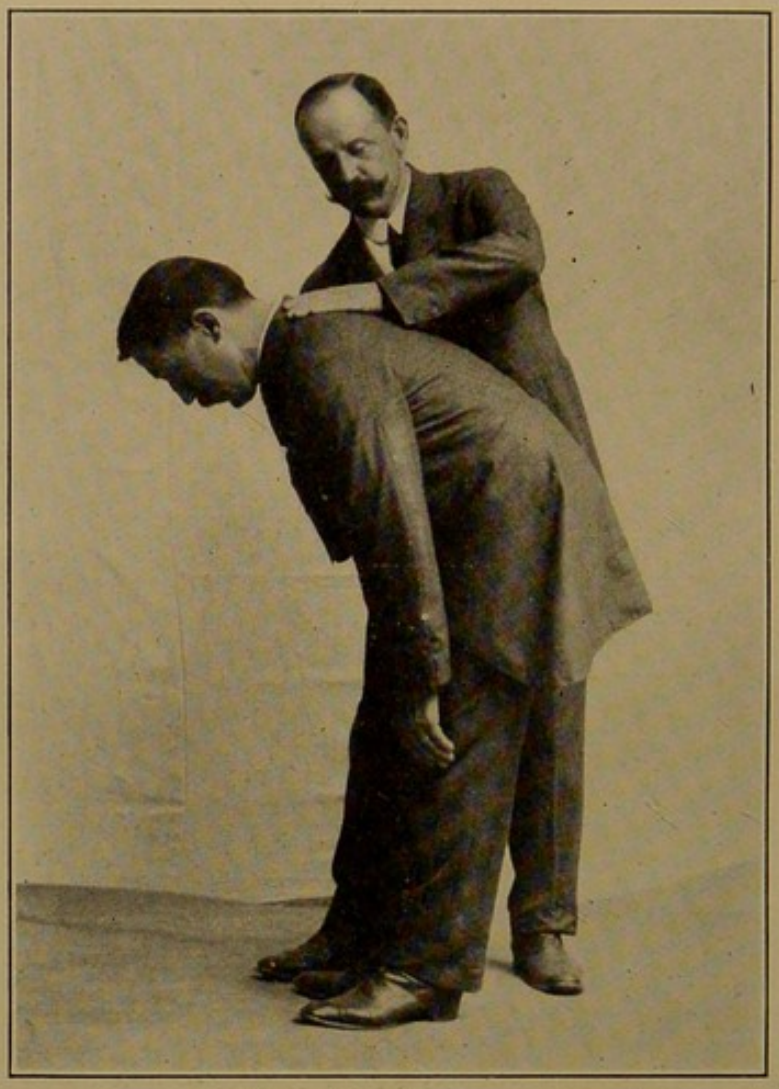

FIG. 14. MOVEMENT NO. VIII—(Conclusion).

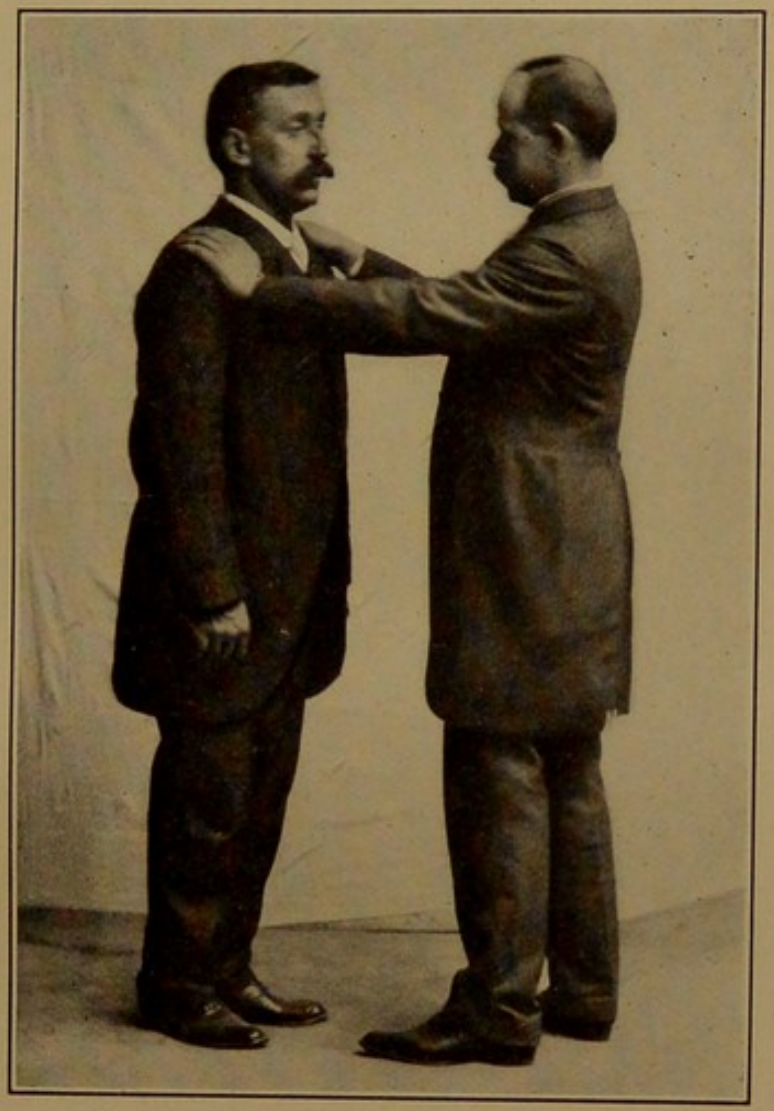

FIG. 15. MOVEMENT No. IX.—The patient stands with the hands at the side, the operator directly in front, placing both hands on the shoulders. The patient is then instructed to forcibly lean forward, the operator resisting the forward movement.

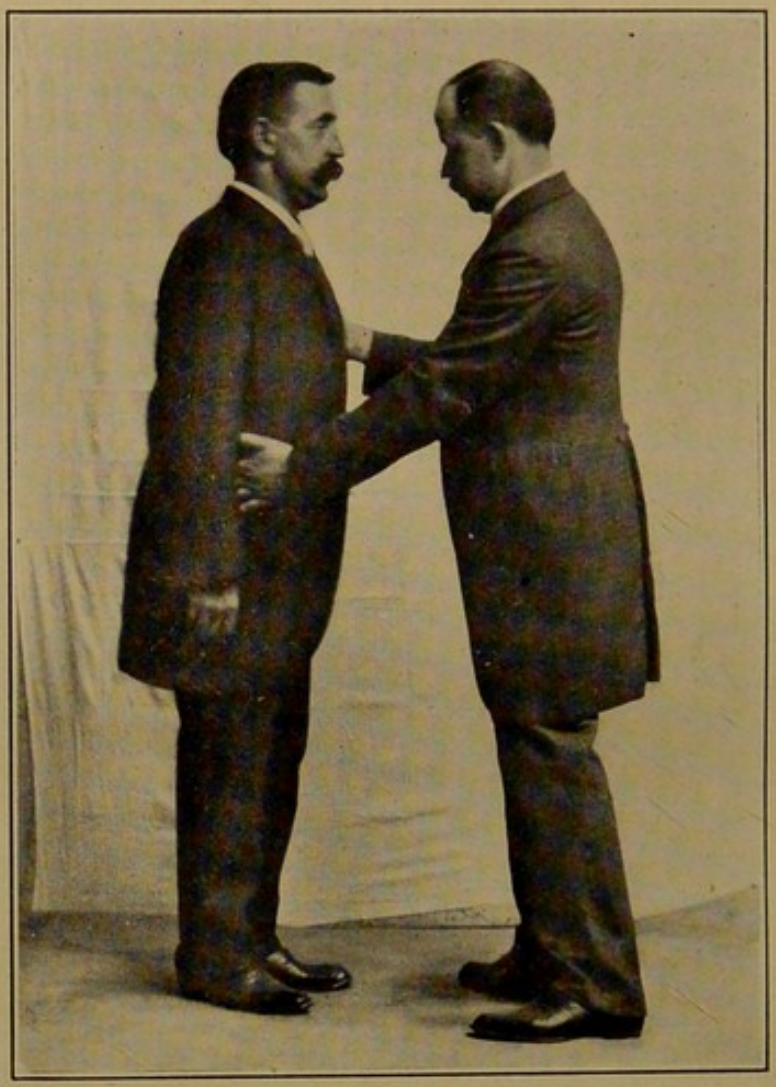

FIG. 16. MOVEMENT No. X.—The patient standing erect, the operator directly in front, the palm of the right hand is placed against the left side under the axilla, the left hand on the right side of the patient over the crest of the ilium. The patient is then instructed to flex the trunk to the right side and the resistance is given by the operator's right hand. The reverse movement is then executed.

FIG. 17. MOVEMENT No. XI.—The patient stands erect, one hand resting on the back of a chair. The operator kneels directly in front with the fork of his hand grasping the patient just above the ankles. The patient is instructed to extend his leg forward, and the resistance is offered to that forward movement. This is repeated on the other side.

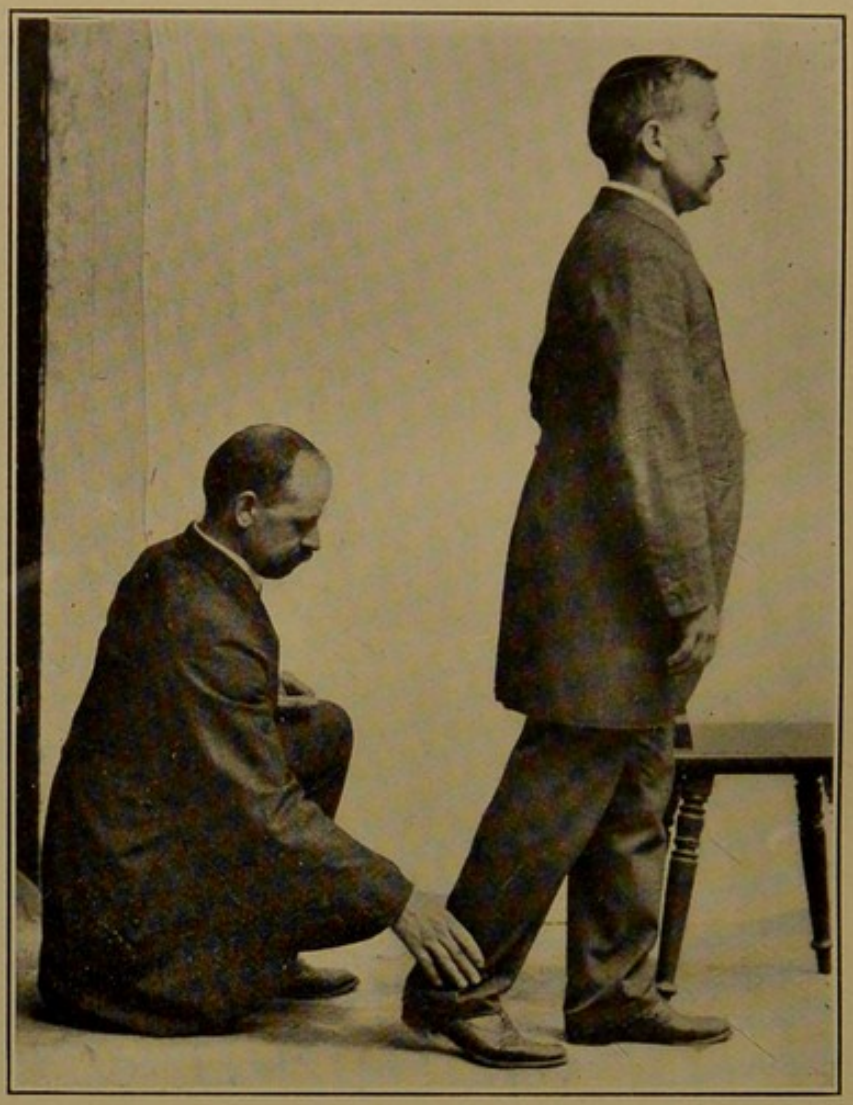

FIG. 18. MOVEMENT No. XII.—The operator kneels behind the patient who stands erect with one hand resting on the chair. The operator grasps the leg of the patient from behind above the ankle. The patient is then instructed to extend the leg backward and upward, resistance being given to that movement by the operator. This is repeated for the other leg.

FIG. 19. MOVEMENT No. XIII.—The operator kneels at the side of the patient grasping the leg above the ankle. The patient is instructed to extend the leg upward and outward. The operator resists the outer movement. This is repeated on the other side.

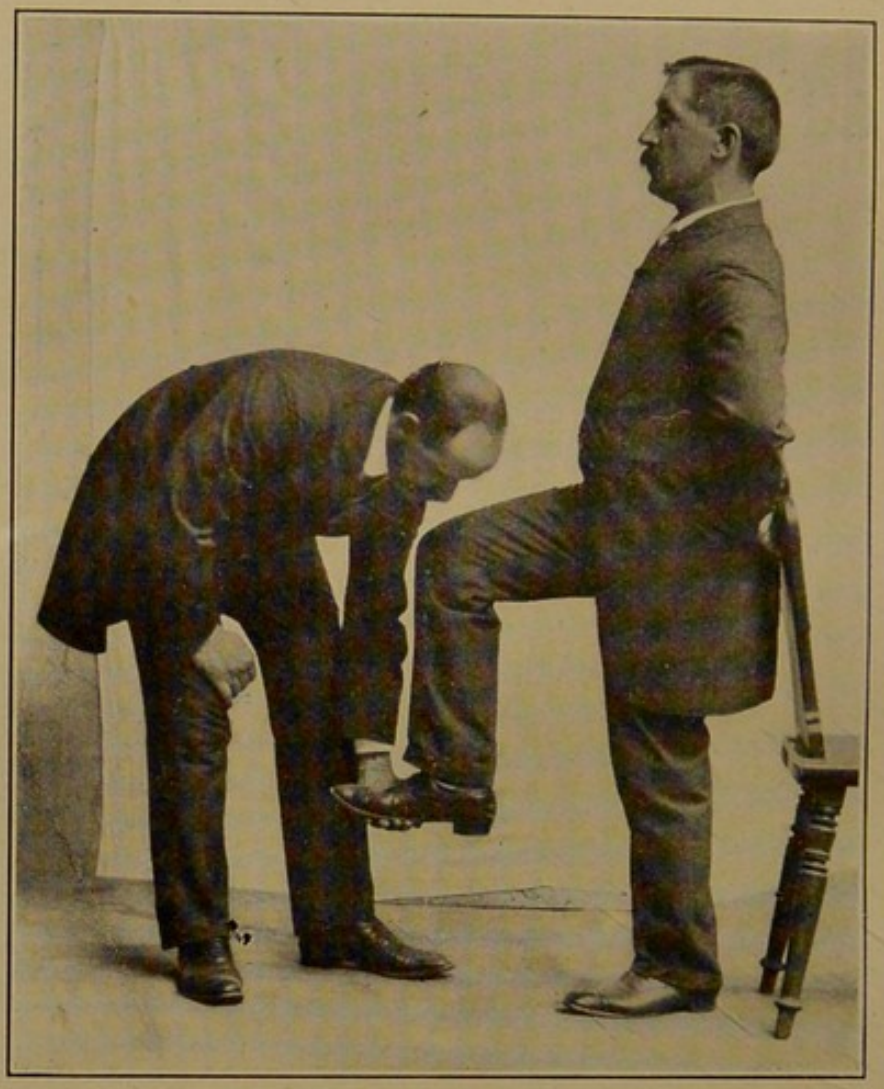

FIG. 20. MOVEMENT NO. XIV.—The operator bending forward in front of the patient allows the sole of the foot to rest in the palm of his hand. The patient is then instructed to press downward with the foot as though resuming a standing position, the resistance being given to that movement by the operator.

FIG. 21. MOVEMENT No. XV.—The patient is seated in a chair with his knees together. The operator kneeling before him places the palm of his hands on the outer side of each knee. The patient is then instructed to separate his knees, the operator offering resistance with both hands to that movement.

FIG. 22. MOVEMENT NO. XVI.—The patient is seated on a chair with his right foot forward, the heel resting on the floor. The operator kneeling beside him, places his left hand on the patient's right knee, his right hand on the sole of his foot at the toe. The patient is instructed to press his foot forward toward the floor, the resistance being given by the operator to that movement. This is repeated on the other side.

FIG. 23. MOVEMENT NO. XVII.—The patient is seated in a chair with his right arm extended, the operator placing his left hand on the forearm pressing the hand backwards on to the wrist. The patient is instructed to extend his hand forward and downward, the operator resisting this movement with the palm of his hand.

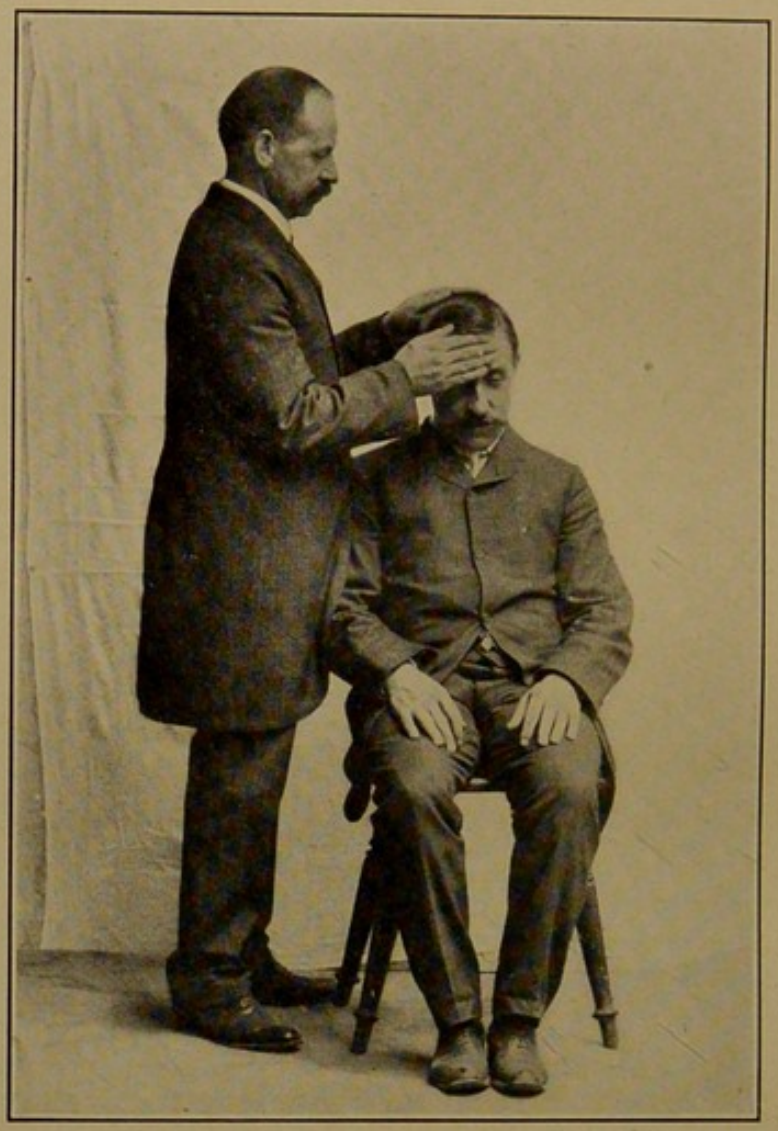

FIG. 24. MOVEMENT No. XVIII.—The patient is seated, the operator standing on one side, the palm of one hand on the forehead and the other at the back of the head. The patient is instructed to bend the head forward, this movement being resisted by the operator The return movement being resisted by the operator in in the same manner.

When working in the bath houses with many patients and using my "Tourniquet-ometer" (blood pressure apparatus), it has seemed to me that, in cases of vascular over-tone, the medium coat of the vessels was relaxed, and cases of relaxation gained a better tone. Other observers concur with this observation. This effect may be due to the influence on the nervous system through the peripheral nerves.

The effect of the resistance exercises I have explained through a relationship between the tone of the voluntary muscles and the tone of the involuntary muscles. The discovery of this method seems to have been founded upon the keen observation on the part of Dr. A. Schott of the beneficial effect of a particular form of exercise of the muscles.

When this form of exercise is analyzed, it is found that it consists of as nearly as possible an imitation of an increase in the natural tonicity of the muscles, one after another, made possible by the resistance offered by the operator. The beneficial effect is dependent upon a very skillful application of the exercises, otherwise the end is defeated. This also was dis-

covered by experience. The result of this manipulation of the muscular tone of the voluntary muscles on the heart and blood vessels is that the heart action becomes slower and stronger and the peripheral circulation is improved. This would be a good field for observation for a physiologist. The exercises seem so simple, that it is hard to realize how much they can accomplish, but this is easier to understand when the supreme importance of muscular tone is thought of and the possibility of reaching the involuntary muscles through the voluntary is allowed.

During the month spent at Nauheim, through the courtesy of the local profession, I was enabled to study numerous cases, but time will not permit a description of them in detail. I used a blood-pressure apparatus at the baths, and I am ready to affirm that I have seen low pressure elevated, high tension relieved and balance restored, as an apparent direct result of the treatment. I have seen the same thing accomplished in America when the essentials of the treatment were carried out.

CHAPTER III

REMARKS ON THE NATURE AND THE CAUSES OF HEART DISEASE

It is necessary to consider the causes of heart disease, because in treatment causes must be removed as much as possible, and after recovery they must be avoided to prevent a return of the trouble.

The greatest advance of modern times in the understanding of circulatory disease is due to the better knowledge of the functions of the heart and peripheral circulation. So long as the heart was considered the only active organ, and the blood vessels were regarded as passive tubes through which the blood circulated, it was not possible to believe in the cure of diseases of the circulation, except in so far as the heart itself could be repaired.

The modern observer sees the origin of most heart disease outside of the heart itself, and discovers a hopeful field for relief in the

indirect effect upon the heart of a proper regulation of its burdens in the general circulation.

When Harvey discovered the circulation of the blood and demonstrated the beautiful picture of the heart pumping the blood through the blood vessels, it made such an impression upon the world that for many years, indeed, now for centuries, superficial observers have been chiefly occupied in admiring the picture, and enough practical thought has not been given as to why the blood circulates as it does. The point that has been slowest to be appreciated is that the blood is circulating through living tubes, and not through a series of inanimate pipes. The function of these tubes is so dependent upon life that, when life is destroyed, they become absolutely incapable of carrying on the circulation. They immediately become relaxed to a degree that makes it possible for the amount of blood in the body to fill them only about one-third full. Under other circumstances during life this force, which should hold the blood vessels to a proper size, may become viciously increased, so that the passages are almost closed, and the blood

does not circulate properly. I have seen instances in which the spasmodic contraction of the blood vessels of a person's hand has been so great that, for the time being, there has been no circulation, and parts of the fingers have been lost through mortification. On the other hand, I have seen many lives lost after severe accidents or in the course of serious disease, by the blood vessels becoming so relaxed that the circulation was stopped. In many instances the heart itself was healthy, but the life of part or the whole of the body was lost, because of the misbehavior of the blood vessels.

It is these truths that seem so plain when called to one's attention, that in modern times have been applied to the study of the disease of the circulation and its treatment, and have led to a better understanding of diseases in which the heart has been the organ that has most attracted the attention of the patient and the physician.

Cases of heart disease are found to arise from two great causes. The first and least frequent of these is infection of the heart itself, arising in the same manner as an attack of

tonsilitis, and often occurring in the course of acute rheumatism or other infectious disease. The second and most frequent cause of heart disease is the strain placed upon the heart by a misuse of the mind and body, whereby over-strained nerves or overloaded digestive organs increase the burden of the circulation. Only a comparatively few persons suffer from heart disease from primary failure of the heart itself.

It seems to me that the treatment at Nauheim gained its world-wide fame many years before these views were accepted because the methods were such as might have been founded on these principles. Of late years, great impetus has been given to the study of heart disease and its allied conditions by frequent measurements of blood pressure and of the waves in the arteries and veins. This is done by instruments that are now familiar to most people, and known as "Blood-Pressure Instruments," and by instruments to record the wave motions in the circulation and known as "sphygmographs" and "polygraphs."

Knowledge has been much advanced by the

extensive application of the experimental methods in the study of heart and blood vessel diseases. Diseases having been produced in animals, are studied by methods that it would be impossible to use in human beings. Passing from the physiological laboratory to the hospital ward, the student of the heart and circulation appreciates the existence in the human body of exactly the same problems that he has learned to overcome in the lower animals. So the modern theory of circulatory disease and its treatment has grown up under the precise observations of scientific minds, and the regulation of the circulation has become a matter of exact art, just as might the regulation of any other intricate mechanism.

The old idea of heart disease that was founded only upon what was seen in the heart after death and disregarded too much the activity of the living body, has passed away, and a new school of medicine has arisen, based upon the study of disease during life. We now know that in spite of structural defects it is possible to so correct the physiologic activity of the body that life can go on happily and

comfortably. This process I have called elsewhere "physiologic re-education." As applied to the nervous system, it is seen in the great movements of psychotherapy that are now taking place in all parts of the world. In regard to organic disorders, its appreciation is shown by the great development of systems of treatment founded upon the subjection of a patient to a suitable régime over a sufficient length of time for a readjustment to take place in the habits of the body.

For our present purpose it is not necessary for us to consider the diseases of the heart and blood vessels in the same way as would be done in a textbook for our students. We are not concerned with heart disease during its acute stage nor with the rarer forms. It seems to me that the great majority of patients suffering from heart disease as they present themselves for the care of the specialist, can be divided into two groups:

In the first and smaller group are those whose trouble has originated in the heart itself. These patients have congenital defects of the heart or have acquired structural changes

through unfortunate attacks of inflammation of the tissues of the heart. Inflammation of the heart muscles as a primary condition, and not associated with general diseases, has seemed to me not very frequent.

The other group and much larger are those whose heart trouble is of peripheral origin. The members of either group are not exempt from additional damage from the same causes found in the other.

The simplest case is that of an individual who has a slight mechanical defect in the valves of the left side of the heart. This often gives a physical sign, known as a murmur. It may be of little importance, provided the extra work that the defect gives the heart muscle does not prove burdensome. If the defect is greater, the heart muscle becomes enlarged on account of the extra demand upon it, but still the patient may not suffer any symptoms of this process, which we call compensatory hypertrophy. The same thing applies in cases of congenital defects. These mild cases ordinarily go on very well until some of the peripheral causes of heart trouble come into play. Extreme valvular dis-

ease is not numerically very common among chronic heart cases, and will not be here seriously considered, but it may be well to say that these also are subject in a great measure to the development of peripheral causes for their importance.

The second group of heart patients have trouble that depends upon disorders of the blood vessels, and it is necessary here to consider certain facts that are not always sufficiently remembered. As is often the case, we must go to evolution for our primary ideas of the development of the circulatory system. In the lowest form of animals that have a circulation, we find certain channels through which the fluid that stands for the blood ebbs and flows in an irregular manner. In a little higher animal, we find these tubes uniformally surrounded by a muscular layer capable of contraction, and that there are valves that determine the direction in which the fluid shall flow. As we go higher, we find that the muscular layer throughout the whole circulatory system is never lost, but that in certain places the muscle is much greater than in others, and

that in these places the valves are more definitely developed, so that some animals have several organs that resemble hearts. In fishes there is a single heart with a single cavity, and in a man, a complex four-chambered organ. The important point is that in man the muscular layer of the blood vessels still exercises its supreme control over the circulation.

The blood vessels in man consist of an outer or fibrous coat; of a middle or muscular coat, and a lining coat. It is upon the degree of contraction of the muscular coat that the size of the blood vessels most depend. So much for anatomy.

The physiology of muscular activity is important in this connection. There are two systems of muscles in the body; the voluntary and the involuntary muscles. These facts are of course well known. A fact that is not so well known is the existence in all muscular tissue of a property derived from the nervous system known as "muscular tone." When a muscle is deprived of its nerve supply, this tone is lost, so that a paralyzed limb is from the very first relaxed and flaccid. This tone is very

important in the voluntary muscles, because it makes a motion regular, the muscles always remaining in a condition of firmness when neighboring muscles are moved.

In the human body, every muscle has opposing muscles or force, and these are always gently pulling against each other, so that they are held in a condition of steadiness. If one muscle is paralyzed and loses its tone, the healthy muscle pulls it all out of shape, and the result is great deformity.

The tone of the voluntary muscles is well known and recognized, but the tone of the involuntary muscles has never received the attention that its importance demands. It is this property of the muscular coats of the blood vessels that maintains an even blood pressure throughout the body, and when it is abolished, as in case of a surgical shock, or destruction of the medulla, death results from failure of the circulation, even though the heart be perfectly healthy.

When the tone of the muscular coats of the blood vessels is increased (e. g., Fig. 25), and if the heart is able to bring it about, there

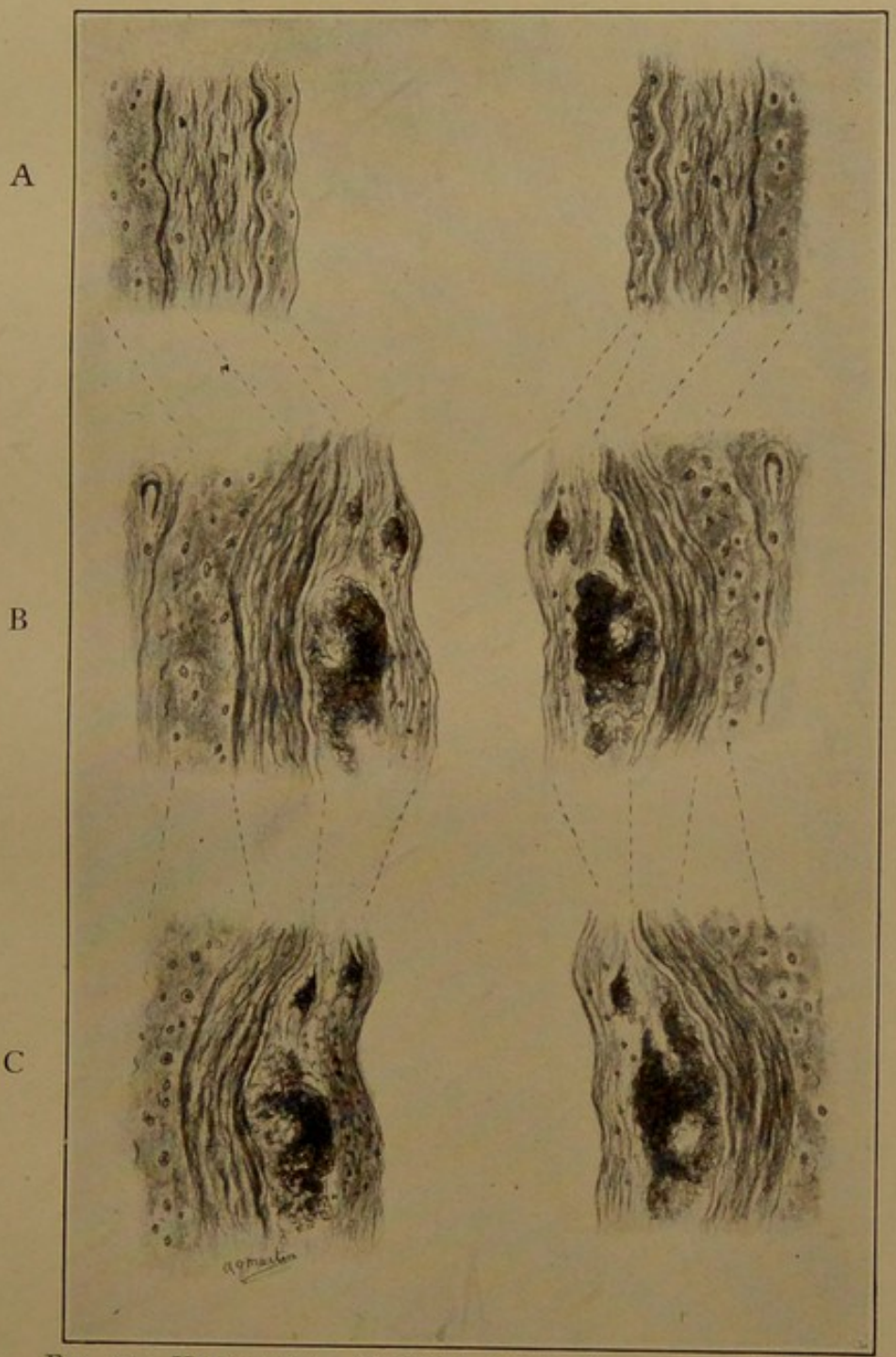

FIG. 25.—HYPERTONIA VASORUM WITH ATHEROMA. (A) Section of normal artery. (B) Atheromatous artery contracted (Hypertonia). (C) Atheromatous artery relieved of hypertonicity. (See page 194.)

results high blood pressure, which can work great damage. The outer and inner coats of the blood vessels, as well as the muscular coat, are liable to changes due to the deposit of fibrous tissue. This we call "sclerosis" (Fig. 28). The inner coat is subject to degenerative changes whereby there are chalky deposits or fatty degeneration. This is "atheroma" (Fig. 25). There are other diseases of the blood vessels, but they could only be introduced here for the sake of completeness, as they do not affect the great majority of patients that we are now considering.

With this scant enumeration of facts, I wish to suggest the following classification of circulatory disorders of blood vessel origin:

1. *Hypotonia Vasorum,* without Cardiac or Organic Valvular Change.

This is found in neurasthenia, from depressing diseases, and may also be of toxic origin. It consists of a relaxation (*Hypotonia*) of the median coats of the blood vessels. The peripheral circulation is poor; the pulse is soft and compressible. The heart force is diminished. The heart rate is often irregular and liable to

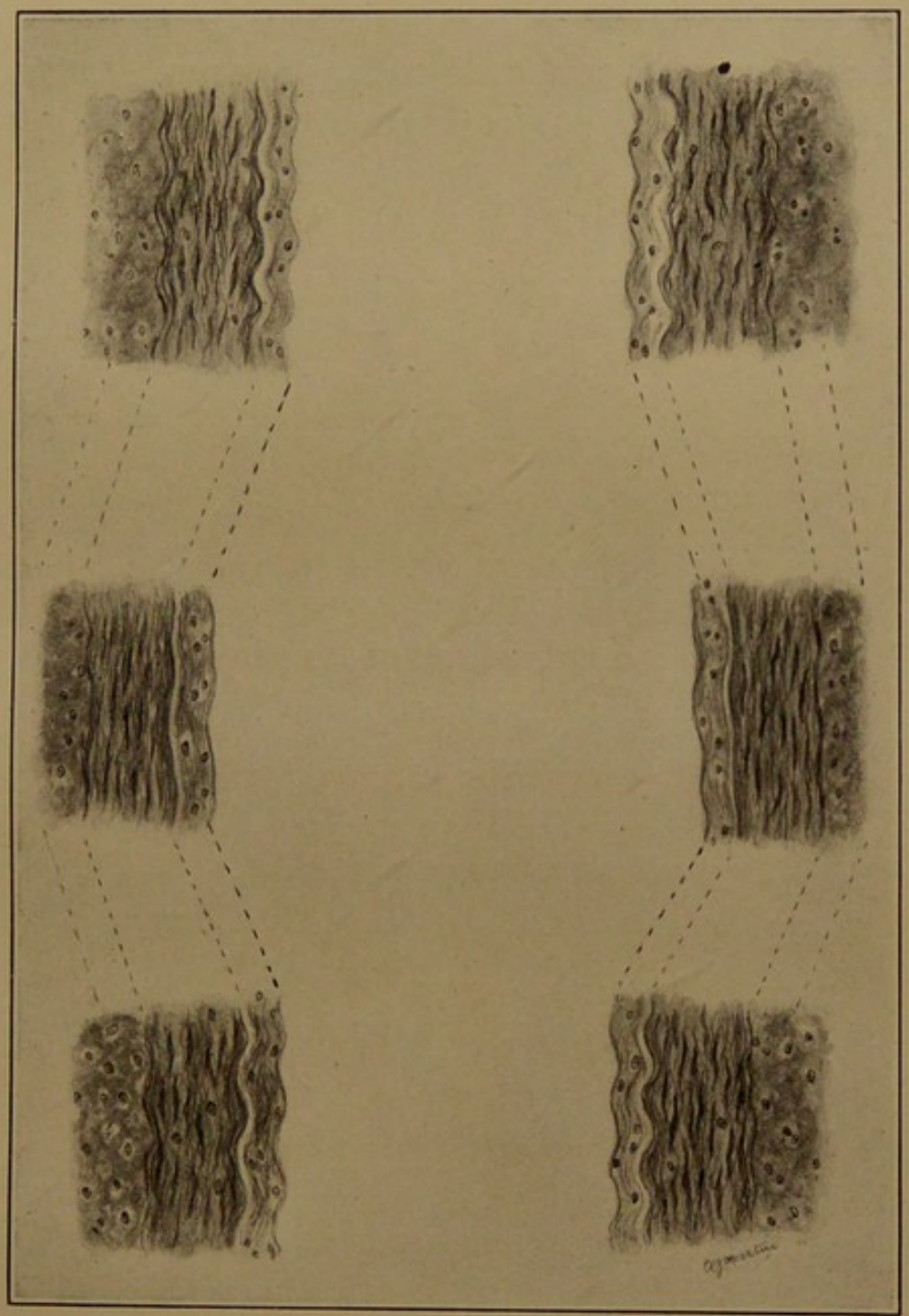

FIG. 26.—HYPOTONIA VASORUM. (A) Section of normal artery. (B) Section of dilated artery (Hypotonia). (C) Section of artery after restoration of tone. (See page 188.)

great increase in rapidity, causing the subjective symptoms connected with palpitation.

2. *Hypertonia Vasorum,* without Cardiac or Organic Vascular Change. (Fig. 27.)

This is found in its simplest form as a functional disorder dependent upon nervous or toxic causes. It is primarily only an exaggeration of a physiologic condition that is brought about by many physical and nervous activities. *Hypertonia* consists of a contraction of the median coat of the blood vessels. Its symptoms are: diminished peripheral circulation; a small radial pulse; cardiac over-activity; an increased force in the action of the heart, which is usually not increased in rate, and there may be some sense of cardiac distress.

3. *Hypertonia Vasorum,* in Cases of Cardiac Weakness Without Organic Change in the Blood Vessels. (Fig. 27.)

This is due to a physiologic reflex representing an attempt of the blood vessels to create the blood pressure required by the body, in spite of the weakness of the heart. The muscular tone of the blood vessels is increased. The radial artery is firmly contracted, and there

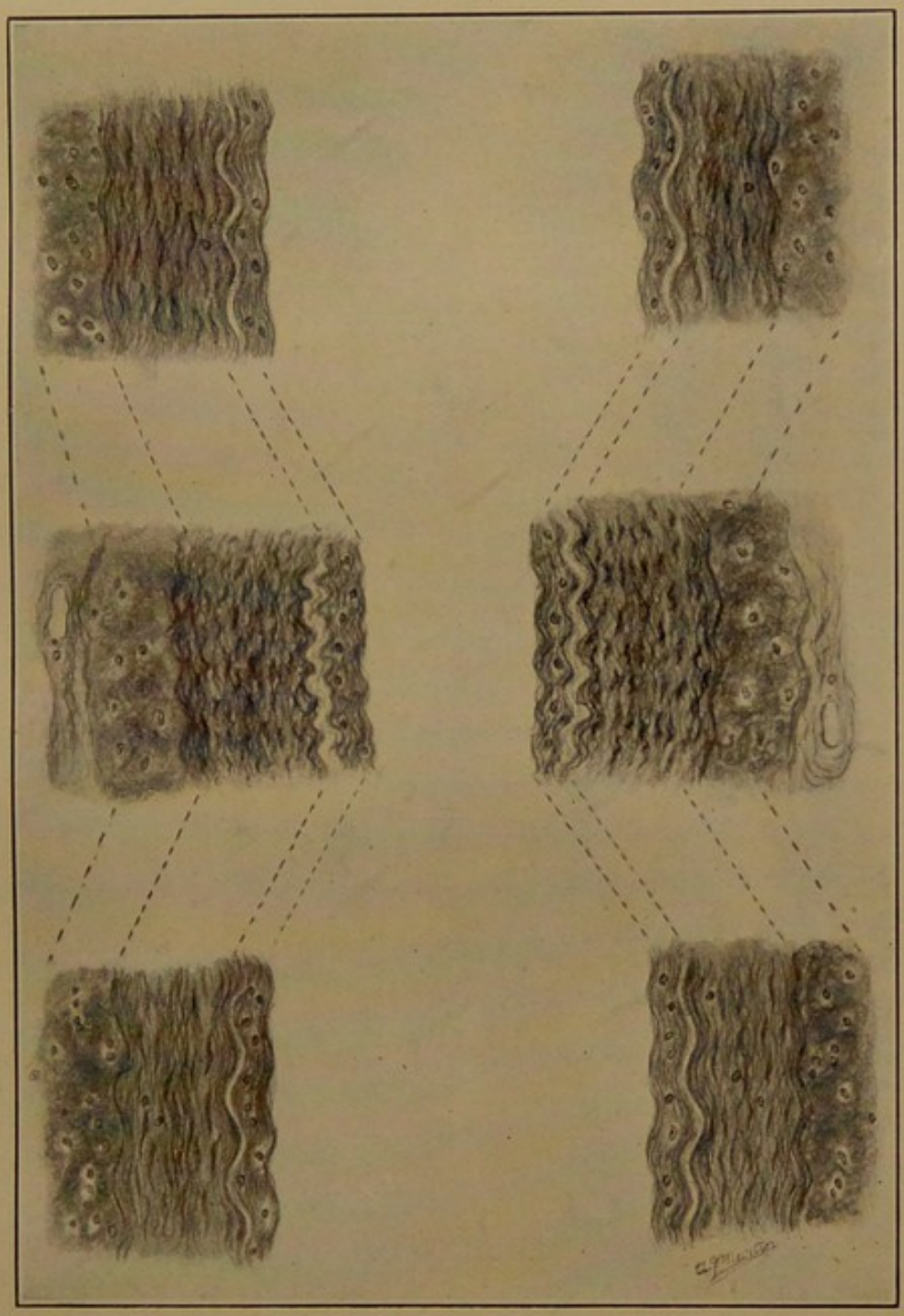

FIG. 27.—HYPERTONIA VASORUM. (A) Section of normal artery. (B) Section of artery, contracted (Hypertonia). (C) Section of artery restored to its natural partial contraction. (See page 190.)

may be signs of defective circulation in the lungs or elsewhere.

The hypertonia must not be mistaken for high blood pressure. This condition often exists beyond a point where it is an advantage and increases the difficulties of the already weakened heart.

4. *Hypertonia Vasorum,* with Arteriosclerosis. (Fig. 28.)

This is found as a further development of the purely functional varieties just mentioned and also in simple arterial sclerosis from any cause. The symptoms are those that result from the hypertonicity of the median coat that is present at least part of the time in all cases of arterial sclerosis in patients who are subjected to the ordinary conditions of a professional or business career. The heart symptoms are those that result from the strain that it is subjected to during the period of arterial tension. Often enough these patients are seen by the physician at a time when the intermittent hypertonicity is absent, and the heart symptoms may be attributed to primary myocarditis. The outlook in these cases is good

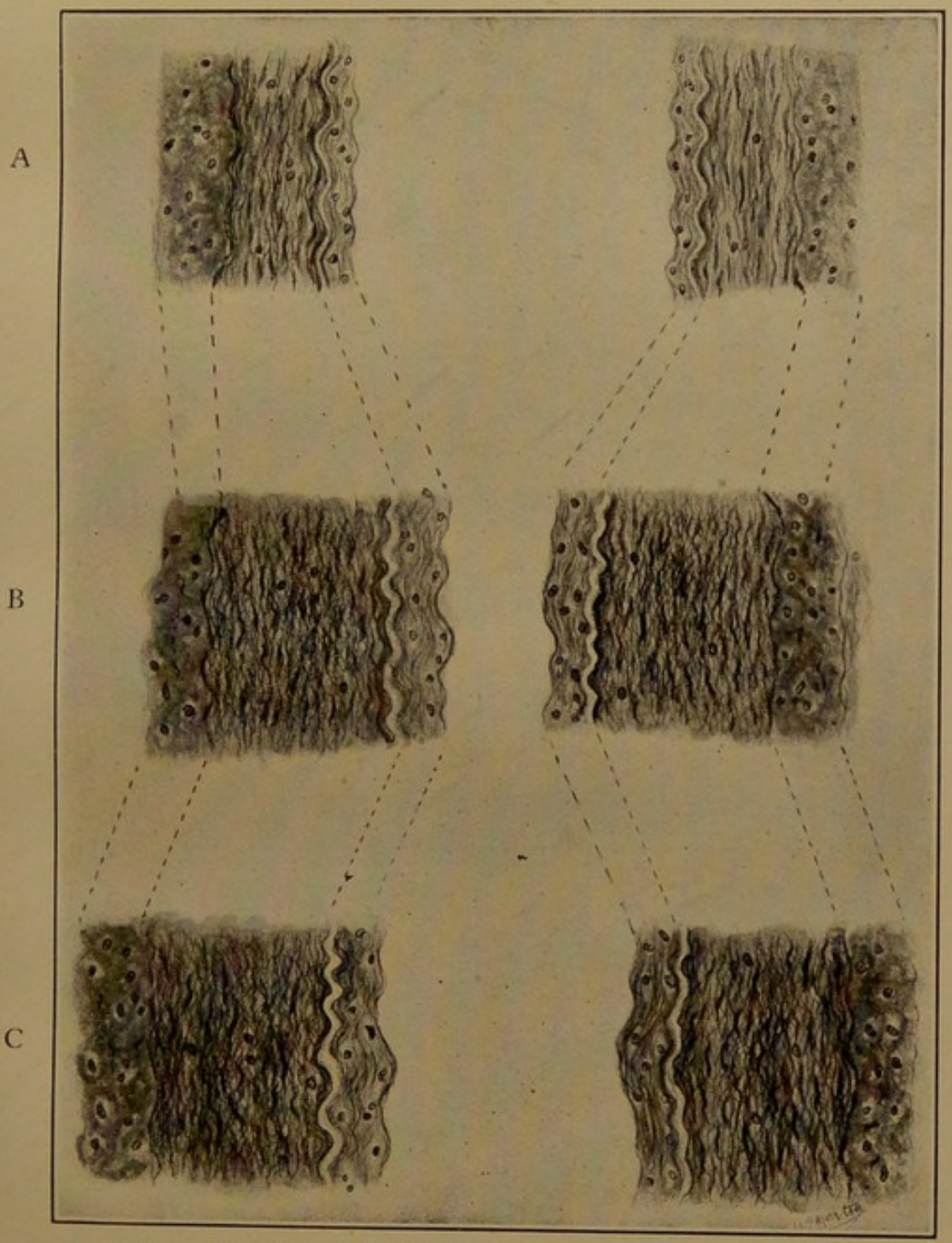

FIG. 28.—HYPERTONIA VASORUM WITH ARTERIOSCLEROSIS. (A) Section of normal artery. (B) Arteriosclerotic artery contracted (Hypertonia). (C) Arteriosclerotic artery relieved of hypertonicity. (See page 192.)

when the occurrence of hypertonic contraction can be prevented by suitable hygiene. These are very favorable cases for Nauheim.

5. *Hypertonia Vasorum,* with Atheroma. (Fig. 25, page 187.)

Atheroma occurs almost as a certain event in the history of nutrition as life advances. It is exaggerated by general conditions, particularly the gouty diathesis, but is in a great measure dependent upon heredity. As every observing physician knows, atheroma may exist for many years without effect upon the individual, and while the existence of atheroma predisposes to accidents of a surgical nature, such as hemorrhages, thrombosis, aneurism, etc., still when divorced from the hypertonic contraction it does not lead to circulatory disorder nor to a harmful degree of cardiac hypertrophy. It consists of deposits in the coats of the blood vessels, particularly in the inner coat, of chalky masses and patches of fatty degeneration. In the majority of cases these are not sufficient to interfere with the contraction and dilatation of the vessels and act very much like the scales of a snake, which

do not prevent it from swallowing an animal larger than itself.

When hypertonicity occurs in an individual with atheroma, the same symptoms follow as in other cases of hypertonicity, viz., the tendency to cardiac strain and dilatation and increased pressure of the blood inside of the vessels. This, of course, makes the possible existence of weak parts of the blood vessels of great importance.

The diagram shows the normal blood vessel; the vessel with atheroma when contracted, and the same vessel when relieved of contraction. (Fig. 25, page 187.)

Cases in which the blood vessels are absolutely brittle, like pipe stems, have occurred in the author's experience, but have been extremely rare, though for many years he has been associated with a hospital service, which draws part of its cases from a home for the aged. The treatment is that of hypertonic contraction, which will be described at length hereafter, but care must be taken to avoid as much as possible the primary rise in the blood pressure that goes with ill-advised exercise. In

order to avoid this primary rise in blood pressure that accompanies procedures designed to relieve these very conditions, treatment must be carefully watched.

6. *Hypertonia Vasorum* with Hypertrophy of the Media. (Fig. 29.)

This condition has not been met with without also hypertrophy of the heart, and it is very frequently associated with dilatation. It occurs as a result of long-continued overactivity of the median coat, and consists of an increased size and strength of the muscular elements, analogous to what happens in the heart later or simultaneously. It is the most serious lesion of the blood vessels, and apparently seldom occurs without subsequent sclerosis.

The symptoms, again, are those of hypertonic contraction. The radial artery is thickened and incompressible to a greater degree than in the slighter forms of sclerosis or atheroma.

The diagram shows the normal artery and the artery with hypertrophy of the media and

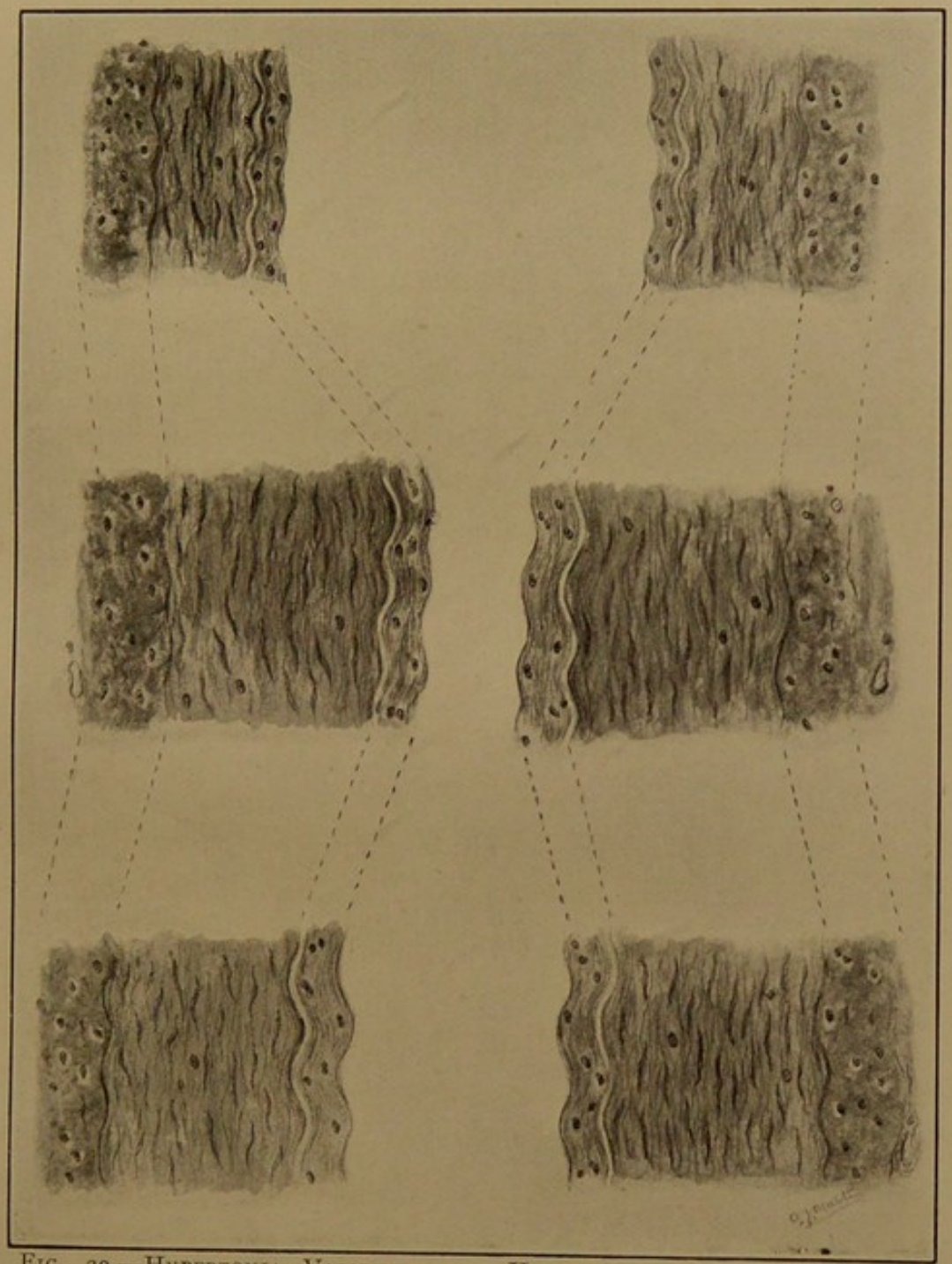

FIG. 29.—HYPERTONIA VASORUM WITH HYPERTROPHY OF THE MEDIA. (A) Section of normal artery. (B) Artery with hypertrophy of the media contracted (Hypertonia). (C) Artery with hypertrophy of the media but relieved of hypertonicity. (See page 196.)

hypertonic contraction, and the artery when relieved of the hypertonic contraction.

It will be noticed that, different from Fig. 27, page 191, even when the hypertonic contraction is completely relieved, the lumen of the artery is still diminished.

The treatment is that of hypertonic contraction and of the cardiac complications. The outlook in these cases is dependent upon the possibility of prolonged hygienic supervision, and it is perfectly possible that after long-continued relief from functional over-activity the median coat may lose part of its hypertrophy.

7. *Hypertonia Vasorum* with Hypertrophy of the Media and Sclerosis.

This is a common lesion in cardiovascular disease. Previous descriptions apply in a great measure. Hypertrophy of the median coat and its hypertonic contraction are the most important lesions. Sclerosis alone can be carried by patients without symptoms until hypertonicity and hypertrophy of the media develop.

The diagram is a repetition of the previous

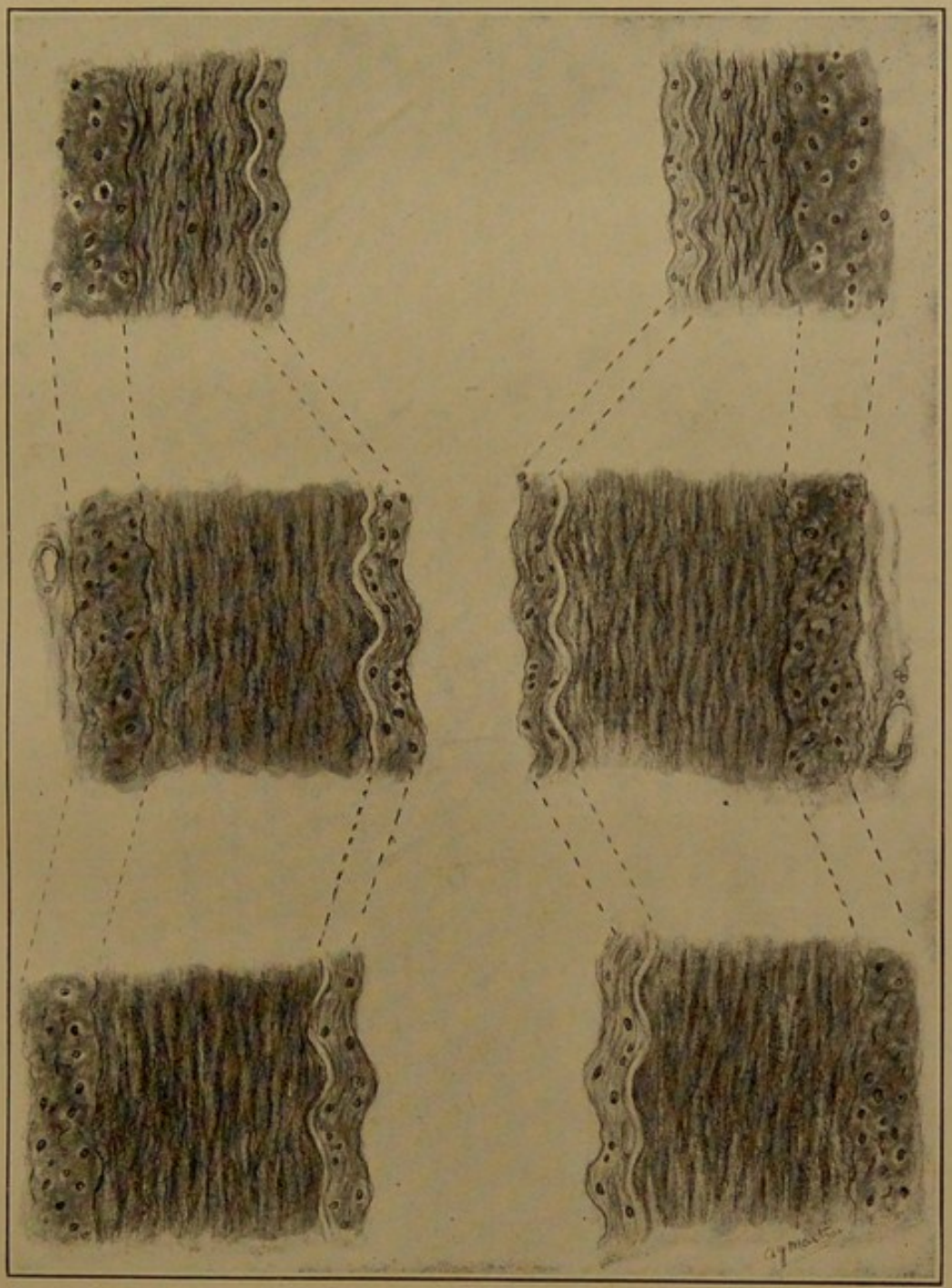

FIG. 30.—HYPERTONIA VASORUM WITH HYPERTROPHY OF THE MEDIA AND SCLEROSIS. (A) Section of normal artery. (B) Artery with hypertrophy of the media and sclerosis, contracted (Hypertonia). (C) Artery with hypertrophy of the media and sclerosis relieved of hypertonicity. (See page 198.)

one, with indications of the sclerosis. Notice the effect of treatment on restoring the lumen of the vessel.

8. *Hypertonia Vasorum* with Hypertrophy of the Media, Sclerosis and Atheroma. Fig. 31.

Here we have all the lesions of the blood vessels combined, and it is hard to imagine such a case without serious involvement of the heart. Hypertrophy of the media is uniformly associated with hypertrophy of the cardiac muscle. Sclerosis presupposes the existence of arterial resistance due to long-continued hypertonic contraction. Atheroma of the blood vessels is often associated with more or less atheroma of the valves of the heart, particularly the aortic valves.

The diagram shows the normal artery; the artery when subjected to these lesions and hypertonic contraction, and the artery when relieved of hypertonic contraction.

The outlook for a patient with all these lesions is, of course, very serious, but the possibility of relaxing the median coat of the blood vessels by hygienic measures, even when the vaso-dilators among the drugs no longer act, holds out encouragement.

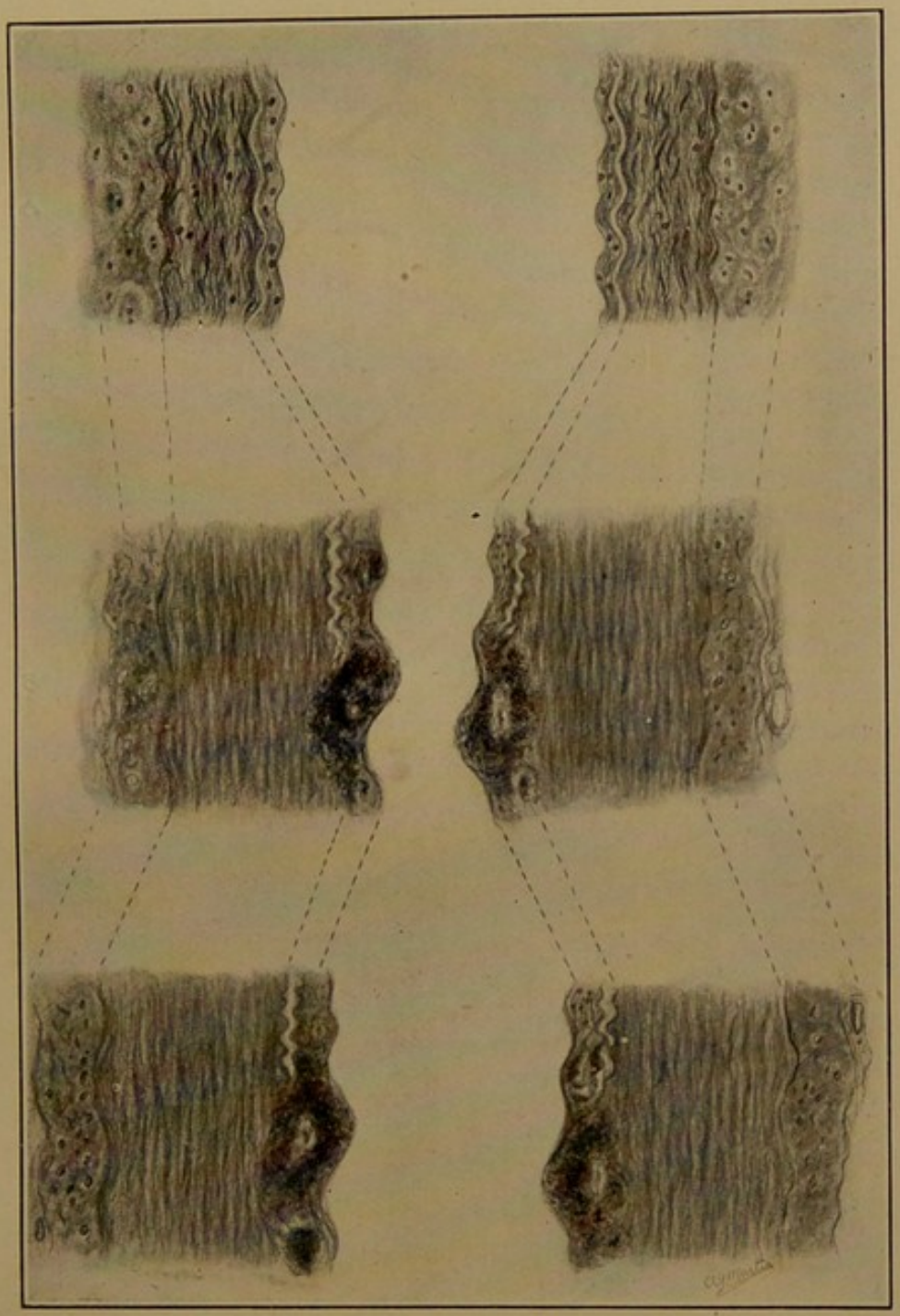

FIG. 31.—HYPERTONIA VASORUM WITH HYPERTROPHY OF THE MEDIA, SCLEROSIS AND ATHEROMA. (A) Section of normal artery. (B) Artery with hypertrophy of the media, sclerosis and atheroma, contracted (Hypertonia). (C) Artery with hypertrophy of the media, sclerosis and atheroma, relieved of hypertonicity. (See page 200.)

Now let us consider some of the things that cause these conditions of the heart and blood vessels. Some time ago I was called upon to lecture to some life insurance physicians on damage to circulatory organs that came through over-strain of the nerves, and I cannot do better than quote from what I said then,* as I wish to consider first the nervous causes.

"The insidious onset of these conditions in those in whom there has been no violation of rules of diet, nor any infection, makes it apparent that there must be causes other than chemical or bacteriological ones. It has seemed to me that there is a class of cases that has its origin in the central nervous system, and that is induced by continuous application to mental toil, and by indulgence in the vice of worry.

"Hypertonia vasorum is a perversion of the physiologic tone of the blood vessels. There exists at all times a force of nervous origin that maintains the blood vessels in a condition of contraction suitable for the proper circula-

* Atlantic City, *June* 3, 1907.

tion of the blood. Without vascular tone, circulation is impossible, because the relaxed vessels would only be about one-third filled by the amount of blood ordinarily contained in the body. The tone maintaining function of the nervous system is carried on through a center in the medulla, but it has seemed to me that this center received its stimulus from the brain, so that the brain indirectly exerts a tone-maintaining influence over the muscles in the coats of the blood vessels analogous to that which the motor areas in the brain exert over the voluntary muscles.

"This analogy is a very suggestive one, and has an important bearing upon the explanation of hypertonia vasorum, and of the curative treatment that has been proved by experience to be of most value. While vascular tone is habitually controlled in health in the higher animals by the central nervous system leading to a harmonious condition of the circulation of the whole body, still there are several local mechanisms that can replace the central influence when that is cut off. When the brain is severed from its nervous connections with the

rest of the body there is a sudden fall of blood pressure, indicating a dilatation of the blood vessels, but very soon the tone of the vessels is restored by the action of the spinal cord. Again, if a limb is separated from its nervous connection with the spinal cord, the vessels are soon restored to a fair degree of tonicity by local action,—thus we have an habitually acting tone-maintaining arrangement, and several emergency tone-maintaining arrangements. The local vasomotor systems usually have to do with the creation of variations in the blood supply as may be needed by the activities of the parts. Thus, where there is great congestion of one part of the body, for physiological reasons, or otherwise, the general tone is still maintained by the central nervous system, compensating for the loss of blood from the whole body to a single part.

"The tone-maintaining function of the motor areas of the brain over the voluntary muscles is a very wonderful arrangement for the regulation of voluntary motion. It becomes most evident when, for any reason, it has been eliminated. Witness the flabby con-

dition of the muscles of a centrally paralyzed limb, or notice the way in which a sound muscle will gradually contract and stretch an opposing paralyzed muscle. Again, notice the physiologic resistance of the opposing muscles in all voluntary muscles, causing an even steady movement of a joint instead of the jerking movement of an automaton. The swelling of a paralyzed limb soon after the interruption of its connection with the brain, suggests the loss of tone of the involuntary muscles of its blood vessels.

"Having thus studied the normal tone of the blood vessels, we are now prepared to take up the question of over-tone or exaggeration of tone in the blood vessels. Hypertension is too often spoken of as if it were a condition engrafted upon the system rather than an exaggeration of an already existing force. When it is regarded as a vicious exaggeration of a beneficient function it is much easier to study its relations, and the hope of cure is also increased.

"The study of hypertonia vasorum in its early stages suggests that it is often a matter

of pathologic physiology rather than the remote result of pathologic anatomy. We do not agree with the axiom laid down by a number of writers that the hypertension is invariably secondary to nephritis, though we do recognize the fact that the kidney is damaged very early in many cases. This statement refers, of course, to the cases that are the subject of our paper—namely, cases of nervous origin.

"The fact that the nervous contraction of the arteries has not been recognized sufficiently has led in very many cases to the belief in the necessary existence of disease of different organs and misdirected energy has been concentrated upon the hygiene of digestion that should have been directed to the hygiene of the mind. The fact is that for most men there is a limit to the amount of strain that the mind can endure without inducing an overaction of the tone-maintaining function, and consequent high arterial tension, with damage to the brain itself, the heart and the kidneys. That work accompanied by worry is much more apt to produce this result than when not so accompanied is not disputed by

anyone who has given the subject thought. Hypertonia of brain origin is very common, not only among wealthy and successful men of affairs, but is found among those immigrant classes with great frequency, who, stimulated by the opportunities in a new country, strain every element of mind and body to realize the full benefit of freedom. The lower East Side of New York shows many examples among those who have come to us from foreign shores."

Of equal importance is the damage to the heart by an excess in food. This comes often enough to men and women who do not worry, who have not over-worked, or used alcohol to excess. Like the previous condition, it may show itself first in the heart, kidneys or brain, but ordinarily the patient commences to suffer first from symptoms attributed to the heart, though the kidneys are sure to be implicated at the same time. Such a patient usually considers himself in good health. He thinks often that he takes sufficient exercise, and is very much surprised when he is told that he is suffering from weakness of the heart muscles

that has come about from a deterioration of the kidneys, blood vessels and heart itself from overloading the system with foods.

When we realize that every particle of food that goes into the body that is capable of digestion is absorbed directly into the blood, and must be taken care of by the tissues, the liver and the kidneys, we can easily realize what a terrific burden is placed upon the whole system by the introduction of an amount of food in excess of what is needed. A portion of this excess food may result in a deposit of fat, but that does not afford much relief, because a person cannot gain a pound a day, while many persons take more than a pound in excess food. Strangely enough this excessive food does more damage than a shortage of food to tissues that make use of every atom of nourishment that is available. So while under-feeding is an evil in a moderate degree, it is much less dangerous than over-feeding.

The first symptom that a person with a weak heart from this cause notices is irregularity of the heart beat, and sometimes palpitation of the heart, that is attributed to indigestion. If the

case is in its beginning, and has not progressed, the physician only notices this irregularity in the heart, and does not hear any murmurs. These very soon appear, however, and are sure to be present if the case has gone far enough to cause an increase in blood pressure.

The third in frequency in practice is heart disease with damaged valves from rheumatic or other infectious diseases. These patients ordinarily come under the care of the physician early in life, and their management constitutes a regular part of the work of the heart specialist. The damaged valves vary in degree and location, and while the progress of the case is fundamentally dependent upon the degree of damage to these valves, still it depends in a great measure upon how the heart muscle responds to the greater demand placed upon it, and how well the mental and physiological hygiene of the patient is taken care of.

The fourth in frequency of occurrence is primary inflammation of heart or blood vessels of a fundamental character.

The heart and blood vessels constitute so large a part of every organ in the body that there are many other causes that can lead to

diseases of these, the circulatory organs. There is hardly any instance of illness in which the circulation of the blood is not an element to be considered. As a rule, however, while the circulation is disturbed, the organs of circulation are not damaged.

Still it sometimes happens that when an acute illness (e. g., typhoid fever) is over, the heart or blood vessels have been injured, and it is necessary for them to be treated.

In a chronic illness the heart gradually becomes weak or the blood vessels contract, and the organs of circulation must be watched.

In certain rare instances the heart is damaged by direct external violence, but this is so uncommon that it need not be discussed at length. One patient that I saw had received a crushing blow on the chest over the heart, and all the circumstances of the case led to the belief that one of the valves had been damaged in this way. The heart must have been struck when it was full of blood and the valve damaged.

A frequent cause of severe heart trouble is a stoppage of the circulation in the arteries that

supply the substance of the heart with nourishment.

Great thinness of the blood very quickly affects the nutrition of the heart and in very pale people the heart is often dilated.

Heart strain from sudden over-exertion, as distinguished from prolonged physical strain, is a very fruitful cause of heart trouble. The question has often been discussed as to whether a perfectly healthy heart can be damaged by its own contractions. This, of course, can never be settled, as after the heart is damaged it is hard to tell whether it was perfectly healthy or not before the damage took place. There are so many causes that can weaken the heart that a large number of people are in a condition which predisposes damage of the heart by strain. We have already spoken of heart disease caused by worry and over-work of the brain and we have explained how this came about.

The other day I saw a man with heart disease, and the signs showed me so plainly that he had suffered from heart strain after a long continued train of circumstances that had

weakened his heart, that I asked him the direct question whether after worrisome business for a long time he had not had some sudden worry that had preceded his attack of urgent heart symptoms. Sure enough he told me that he had worked very hard for a long time to try to make a success of his business, and that when the sudden slump in business of a few months ago had made it impossible to continue, he had given up and was terribly discouraged. The man had a broken heart in the sense that it was greatly dilated, and he had swelling of the feet and tenderness over his liver, shortness of breath and all the cardinal symptoms of heart exhaustion.

Last Sunday morning I saw a college student whose heart was somewhat dilated, but who was otherwise in perfectly good health. He told me that he had never had any trouble until he had taken part in a foot race, after which he was "terribly pumped," as he expressed it and could not get his breath back for nearly a whole day. He was perfectly cheerful and a happy boy, and there were no nervous elements at all in his case; he had

simply strained his heart by over-exertion, and the strain had been so bad that the heart had never gone back to its natural shape. These cases occur every day in one's practice in the treatment of people with heart trouble, and it must be realized how important an element mental and physical strain is in causing heart trouble, particularly when tendencies exist.

I once had a very remarkable case in a woman, who, when the house got on fire, was so frightened that one of the valves of her heart was torn, and this torn valve hung in the blood stream like the reed of an organ, producing a sound that for several years, until the woman died, could be heard half-way across the room. So, even the valves are sometimes damaged by sudden strain. Usually the walls of the heart are strained.

There are two kinds of heart trouble, organic heart disease, with changes in the tissues that can be seen, and functional heart trouble, in which the heart acts badly without these changes. Organic disease consists of valvular deformities, softening of the heart muscle, fibrous changes or rupture of some part of the

heart. In functional troubles you cannot see any changes in the heart, but while it is alive and working, it misbehaves itself and does not act properly. The causes of functional trouble are often outside of the heart itself. Thus they are found in irritation of the heart by digestive disturbance and its products, by nervous diseases, such as nervous prostration, hysteria, insanity, or any profound disturbance of the nerves.

Functional troubles also come from tobacco. It makes the heart irregular and irritable, so that some persons who use tobacco to excess, though they have no apparent organic disease at all, may suffer from palpitation. The pulse shows extra beats stuck in where they do not belong, and you find that the beats that do occur are not all the same in force. In other words the heart is functionally deranged by tobacco. Only a certain number of people are so affected, so that we are led to the thought that there is an original underlying weakness in such hearts. Indeed twenty years of experience with heart patients has shown that most patients who were supposed to have functional

heart trouble have later developed undoubted organic disease, unless great care was taken.

The heart is also functionally disturbed by certain conditions of other organs, particularly the secreting organs. For instance, the thyroid gland may become enlarged, and secrete more than it ought to and cause a very rapid heart action. This week I saw a patient in whom the heart was running from 160 to 200 beats, from poisoning from the thyroid gland. The heart itself had no organic disease.

When we come to the causes of organic disease of the heart, the one that we first think of in the order of its importance is overwork and strain of the heart, due to high blood pressure or arterial tension. This we find, as noted above, in its simplest form in the arterial tension due to worry and mental strain. In other words, in those who lead a high tension life. We find it in business men, we find it in women who carry responsibility and do not take enough rest, we find it in the best workers in the world who work too hard. These people who lead this life of strain without sufficient rest develop a high arterial ten-

sion, that is the blood in their blood vessels gets to be under a great deal of pressure. This makes it hard for the heart to do its work, and the heart becomes enlarged, and this in turn makes a higher blood pressure, and the arteries are finally greatly damaged, and the condition drifts into heart disease and invalidism follows.

This is the simplest form among previously healthy and strong people who have carried burdens and worries without sufficient rest, and is essentially a hypertonicity of the blood vessels leading indirectly to heart trouble. This may be called the nervous cause.

The next form of strain of the heart that we think of is physical strain. This we have sufficiently illustrated above.

Organic heart disease that comes from direct damage of the valves through inflammation occurs usually in younger people. This occurs in rheumatism, it occurs also in infectious diseases, and sometimes occurs without discoverable cause.

Heart disease of older people is much more apt to arise originally from causes outside of the heart, which work back to the heart, while

in young people the heart disease often starts in the organ itself.

Organic heart disease may exist from birth. This is not very frequent in proportion to the whole number of heart patients, but occasionally we see people who have heart disease from birth. Sometimes certain vessels which exist before birth and ought to be obliterated after birth are not obliterated, so that the blood flows from the arteries to the veins, and the heart finds difficulty in giving the body a proper circulation. This is congenital organic heart disease.

I have spoken of these two groups as definite things, that is, I have spoken of functional heart disease, and organic heart disease as definite things. That is not true to nature in most instances. Usually there is a combination of the two, in other words, we have a certain amount of organic weakness and a good deal of functional disturbances going together, the nerves and the organ itself both being at fault. A very frequent example of this is seen in the dilated heart that succeeds infectious diseases. After typhoid fever the nerves are

also weak and the patient is liable to all kinds of disturbances of circulation, and the heart muscle itself is weak from the poisons of the disease. Of late years there have been many instances of combined organic and functional disease following the grippe. Many persons, following a severe attack of grippe, have weak hearts; these hearts are definitely weak in that they do not respond to demands on them for work, and at the same time nervously upset in that they are intermittent and irregular. I want to repeat these distinctions.

In the first place, there is organic and functional heart disease. By organic we mean that there are definite changes in the tissue of the organ itself that are visible and can be seen. Functional means that the heart goes wrong, acts badly on account of something interfering with its proper action. There is a third form, and a very frequent one, in which there is both organic and functional disorder at the same time. The causes of organic heart disease, considering first older people, are functional strain, due to worry, and mental strain, indiscretions of diet, physical strain, due to over-

exertion and the damage to the heart by infectious diseases damaging the valves and the structures of the heart. The functional disorders are due to digestive disturbances, to the presence of nervous disease, diseases of the thyroid, and the weak heart following infectious diseases. The disturbances from digestive disorders lead to organic disease, as I will try to explain. I know that it is the custom to make light of heart symptoms and to say that the so-called heart trouble is nothing but indigestion. This is a very dangerous thing, if, as I believe, digestive disturbances lead to organic heart and kidney disease. My observation is this:

I have or have had examined at my laboratory over 20,000 specimens of urine, and quite a number of the patients I have been able to follow. Most of the specimens were from the practice of other physicians, but I have often been able to hear about the cases. Now I find digestive disturbances due to taking too great a quantity of food lead to indicanuria. I have often found these people were the ones who suffer from so-called heart trouble with

the blame put upon the stomach. In following these people for a long period of time I found that the indican in the urine, which was the first chemical evidence of the indigestion, was succeeded in a very few years by albumen in the urine, and this was accompanied by involvement of the heart muscle, leading to palpitation and to the soft murmur and the dilatation that we encounter so often. Where the condition has been unchecked and not taken care of, and where the patient has not been put on a régime of baths, diet, etc. I have seen these people, after the albumen has existed for a time in the urine and the heart had become functionally deranged, drift into the condition of chronic Bright's disease.

This seems to be a definite connection between functional disturbance of the heart going on to the development of heart and kidney disease of the ordinary type. I believe that this happens to just as many people from the taking of too large a quantity of food and suffering from intestinal putrefaction and stagnation, as happens to people who drink too much, and I would rather have a person take moderate

quantities of alcohol and food than I would have them take excessive food and no alcohol. The abuse of alcohol is so often also present in those who eat too much, that the food element is overlooked. Excessive food and lack of exercise leads to heart trouble in these cases and alcohol is put down as the cause.

I like the name Bright's disease. It is not kidney disease. It is not blood vessel disease. It is not heart disease. It is a degeneration of all these organs grouped together in one disease. If we call it nephritis, we leave out the blood vessels and heart. If we call it arteriosclerosis, we leave out the kidneys and heart. If we call it heart disease, we leave out the arteries and kidneys. Indeed, I would say that there is another organ that is also included in Bright's disease, and that is the brain. The heart, kidneys, blood vessels and brain are the organs involved, because the brain never escapes some damage in Bright's disease. It very often leads to attacks of paralysis, it leads to delirium, and the brain symptoms are a part of the disease. The brain is always threatened in heart troubles in one way or the other.

CHAPTER IV

SYMPTOMS OF HEART DISEASE AND PRACTICAL ADVICE TO HEART PATIENTS

THERE is a popular belief that discomfort in the region of the heart ordinarily comes from indigestion, and yet pain of some form or other in the region of the heart or elsewhere is present in nearly all persons with heart disease after the trouble has gone on for some time. This is particularly true of the heart troubles of older people.

The next symptom that must be considered is irregularity in the heart's action, as noticed by the patient. In perfect health, a person should not feel their heart at all, except, perhaps, when it has been very much excited by violent exercise. Anything that makes a person feel his heart means that there is something wrong. This may consist only of a consciousness of the regular heart beats, or one may feel as if the heart stopped, or as if it turned over.

When the right side of the heart is strained people sometimes describe a sensation as if there were an animal moving under the breast-bone.

There are two general conditions that must be considered.

In the first place diseases that have not interfered with the power of the heart to do its work are often only discovered by an examination of the heart that is made for some reason, such as life insurance, or in the routine examination on account of some other ailment. The physician finds the heart thickened or stretched so as to be dilated, or he hears the blood, which ordinarily passes silently through the heart, making a sound called a murmur. From these things he knows that the heart as a working machine is defective and that it is liable to fail under any strain or in the progress of time, and to become unable to make the blood circulate. Still at the time the sufferer from these conditions may have no consciousness that anything is wrong.

Weakness of the heart so that it cannot do its work makes itself known in three principal

ways, and none of these would suggest the heart as being the organ out of order.

Shortness of breath is the first of the three, and is always present when the heart is acting weakly.

The second is swelling of the feet, because the blood does not circulate properly.

The third is tenderness over the liver, and is detected by pressing over the pit of the stomach.

These are the three signs of heart disease that has gone on to a weakness of the heart. Pain may be and usually is absent for quite a long time, and is liable to be associated with the kind of trouble that is found only by the examining physician. Severe pain in the left arm is very suggestive of a hardening of some of the structures of the heart. So much for the heart itself.

Of late years much has been learned of the cure of disease through the better knowledge of the disorders of the blood vessels. It is now known that the blood vessels are equally liable to disease with the heart, and are even more benefited by proper treatment.

In various forms of heart disease the rate of the heart may be very much increased, or very much diminished. The forms of heart disease which increase the rate greatly are chiefly those of nervous origin. In Graves' disease, which is a nervous affection, involving the thyroid gland, the heart becomes very rapid indeed. This may also occur in the course of many acute conditions. In fever the heart is rapid, as every one knows, but in the course of typhoid fever it sometimes happens that there is a tremendous increase in rapidity that may cause much anxiety. In grippe, in diphtheria, pneumonia, and, indeed, in acute diseases, there may be attacks of very rapid heart action, but the form of rapid heart that interests us most are the attacks of palpitation which affect persons with heart and arterial disease. I have observed a number of times patients who were supposed to have heart disease, and in whom I found that the attacks of great rapidity of the heart were a reflex from arterial disease, such patients often suffered from very high arterial tension. These patients were relieved when their ar-

teries were treated as they never had been when only the heart was regarded.

Great slowness of the heart may be due to some irritation of the nerves whose function is to slow the heart. But more often in practice it is due to some form of poisoning. It may arise from lead poisoning. It may arise from the excessive use of drugs, which have the power of slowing the heart. It may also occur from poisons arising in the digestive organs, and is quite frequent when bile is absorbed and causes jaundice.

Occasionally we see very slow heart action in the nervous diseases, and quite frequently where there has been an injury to the brain.

Recently I have had a patient with a very slow pulse from disease which destroyed a particular muscular bundle in the heart that conducts the contractions of the heart from the part in which they begin to the part which causes the pulse. This patient unfortunately died of his disease, and an examination showed an existence of a calcareous nodule at this place. In this patient the extraordinary con-

FIG. 33.—SYNCOPAL ATTACK IN ADAMS-STOKES DISEASE.

dition existed of one part of the heart being very rapid, and the other part very slow.

The only thing that the patient noticed was frequent attacks of fainting. This combination of symptoms has been known for many years, but the cause of it has only been recently discovered. It has been known as Adams-Stokes Disease, after the men who described it. The case is to be published in the *American Journal of Medical Sciences* for this year (1909), and I have borrowed the accompanying illustrations from this journal.

A picture of the patient during one of the characteristic fainting attacks; a tracing of the pulse in the jugular vein, showing the rapid action of the auricle, and the slow action of the ventricle; and a picture of the heart, (see frontispiece) showing calcareous nodules below the aortic valves where this remarkable structure (the bundle of His) is met with.

Of course shortness of breath, swelling of the feet and tenderness over the liver are due to the poor circulation acting on the lungs, the extremities and the liver, but when we look more closely we find that there is a stagnation

of blood in the veins, which gives rise to blueness of the lips, a high color of the face, and congestion everywhere. This high color of people with heart disease often gives a false appearance of health. The poor circulation in the lungs leads to a tendency to bronchitis, and very persistent troublesome form of cough, congestion of the stomach leads to indigestion, and in neither case can the patient

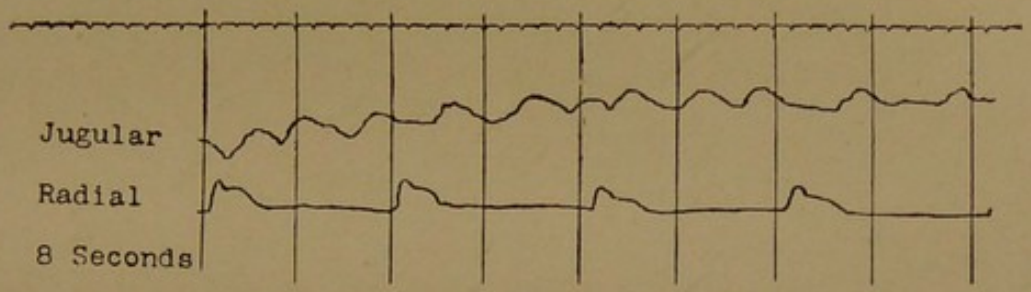

FIG. 32.—PULSE IN THE VEINS OF THE NECK AND AT THE WRIST IN ADAMS-STOKES DISEASE

be relieved until he is treated for the heart trouble. Sometimes the congestion of the lungs is so great in heart trouble that persons so affected have hemorrhages.

The congestion of the kidneys interferes with their action, and many persons with heart trouble are supposed to have kidney disease, which entirely disappears when they are properly treated.

When heart trouble is more advanced, the swelling of the tissues becomes very great, the patient is dropsical and every part of the body gets saturated with the blood serum that has escaped from the vessels, and the natural cavities in the body are filled in the same way.

When the lungs become dropsical the patient is said to have oedema of the lungs. This is a very dangerous condition, and may come on suddenly. It is accompanied by great shortness of breath.

The author, living at the time of writing in a place (Nauheim) whose wonderful growth is founded upon faith in the cure of this disease, it is hard for him to realize that so large a part of the medical profession and the public are still influenced by the effect of the old teaching that disease of the heart when once acquired is necessarily permanent. The statement is frequently heard that heart disease cannot be cured, and the statement is clinched by the question: "Can you cure a deformed heart valve?" The argument is a good one or it would not have been so constantly repeated for so long a time. It is best

met by another question: "What percentage of cases of disease of the heart are founded upon deformity of the heart valves and upon this alone?" I have had patients with malignant endocarditis in whom a rapid destruction of the valves led to complete incompetency of the heart and resulted fatally. But even in a hospital of large size, this has only happened once or twice in ten years. I have seen men reach the age of seventy or more years bearing without trouble an uncomplicated deformity of the valves acquired in early life. I have seen death in those with valvular disease of the heart from accidents, such as embolism, but I have never seen other deaths in valvular disease that were not complicated by the results of the failure of the heart muscle or of uncorrected disorder of the peripheral circulation.

A great deformity of the heart valves is found only in a very small percentage of all patients with heart disease, and moderate deformities, when the patient is properly cared for, are not of much importance. It is not ordinarily a valvular defect in the circulatory apparatus that is necessary to correct, so much

as the exhaustion of one set of organs by the misbehavior of another set. Thus it is frequently found that the muscular system of the blood vessels, that should be only just active enough to properly regulate the flow of blood, is opposing itself to the muscle of the heart to no practical purpose, and the combination is injuring both the heart and blood vessels. This is brought about by influence which can often be removed with the result of practical cure in many cases. When a muscle is called upon for unusual work over a long period of time, it becomes enlarged and hypertrophied. When it is relieved of this work, it goes back to its original condition. Thus an athlete, when trained for a particular event, has muscles in a state of enlargement, which they lose when he stops training.

The same is true of the involuntary muscles of the heart and blood vessels. When they are called upon for extra work they become larger and often abnormal in their actions. When they are relieved of the demand for this work, they are again restored to their original conditions.

Many cases of heart disease are founded upon an exhaustion of the heart muscle, because, without adequate development, it is opposed to contracted blood vessels whose muscles are over-active. When the over-activity of the muscles of the blood vessels is removed, and the heart muscle is strengthened and restored, the particular case of heart disease is cured, and even the sceptic be convinced of cure, because the patient is well. We often hear complaint of the lack of permanency of the cure of heart disease. The modern physician is not satisfied with simply treating and curing his patient; he also teaches him methods by which he may remain well. It is perfectly true that the cure of heart disease is not permanent if the same causes that produced the original trouble are allowed to become active, but a reasonable adherence to the continuation in principle of those conditions under which the cure took place will lead, in most instances, to more than average healthfulness, and the continuation of life beyond the period enjoyed by most persons who have never learned to take care of themselves.

The patient who has once shown a tendency to circulatory disease of an important character must never dismiss from his mind the care of his health. By this, we do not mean that it is necessary to become invalidized or to become an hypochondriac, but that his life must be so planned that he may live out his expectation, except he be overcome by an accidental infection or injury.

The cure of circulatory disease is like the adjustment of a machine to the work it has to do and the conditions under which the work must be done. However well this is done, there is always a tendency toward things getting out of adjustment. In the human body there are many arrangements destined to attend to adjustments.

This is most often accomplished by what is called compensation. But the very mechanisms themselves that are destined to bring about adjustments are just the ones that have gone wrong in those whose circulation is disordered. In the case of the circulation, nature's favorite means of compensating for defects is by an increase of the natural tonicity of the blood

vessels. This is beneficient up to a certain point and prevents the patient from consciousness of the underlying disorder, but it demands of the heart the maintenance of a high blood pressure, and in the long run leads to damage to heart, blood vessels and kidneys. So the behavior of the blood vessels should be watched by a physician trained to judge of them. The findings of the instruments now in use must not be interpreted by anyone, except the physician who knows what the findings mean. The patient who concerns himself with his "blood pressure" is doing a very foolish thing and insuring himself endless anxiety and confusion. The same is true of "murmurs" and "enlargements." These matters belong in the province of the physician, and if abnormalities are known to exist, should be inspected at regular intervals that are determined by the physician.

As to the signs of disorder of the heart and circulation that force themselves upon the patient's notice, the patient has a right to know their true significance. All hearts do not do their work in the same manner, any more than

all locomotives, even those of the same design. Engineers tell us that locomotives have an individuality. So have hearts. Individuals vary as to their consciousness of the action of their heart even in health, and hearts vary greatly in their ability to make themselves felt. For these reasons the patient must be guided by the advice of his physician as to which of his conscious symptoms he must regard as important and which he must not allow to occupy his attention. The patient who has had a proper cure has been taught all these things, and he will be wise if he repeats the cure as often as his physician determines to be necessary. It ought not to be possible to put these things in a medical book with the expectation of reaching directly those who need these admonitions, for patients, and above all heart patients, should not read such books, but it has become so much the fashion for people to read and discuss the technicalities of our art that this is sure to reach the eye of some who are patients and not physicians.

CHAPTER V

NAUHEIM-SCHOTT TREATMENT IN NEW YORK

In the development of knowledge things generally happen in a particular way. Humanity struggles along until by chance, or by the genius of some individual, something is discovered that under a given set of circumstances proves of great advantage. This happens in some place under the direction of some particular man, and the fame of what has been accomplished travels so that people who need the kind of benefit that has been accomplished, will rush to this place, and to this man, and go away singing his praises and expressing their satisfaction.

The next step is the study of the subject quietly and in order, and the relentless analysis that comes to all human achievement as time goes on. It is a good thing, indeed, the fame of which can last for twenty years and extend

over the whole world. Finally the principles that govern the achievements of the particular man and the particular place are discovered. Then it becomes merely a matter of knowledge and the adaptation of means to an end to accomplish the same results elsewhere; though circumstances are not the same and much more effort is necessary to do things when the attending circumstances are not favorable. In regard to the Nauheim-Schott treatment of disease in New York and other cities, it may be said positively that it is perfectly possible to carry out the treatment with as much success as at Nauheim, provided the patient and the physician are willing to put forth an amount of effort corresponding to the natural difficulties.

It is hard to analyze the sum of the benefits of a "K U R" treatment, so the relative value of each element shall be given. The reputation of the cure at Nauheim depends upon a sum of benefits that is hardly equalled elsewhere.

The composition and temperature of the waters, the peculiar effect of the atmosphere

on the nervous system, and the social conditions depending upon the large number of people in hopeful search of relief are not duplicated elsewhere. However, the underlying principles are easily understood, the waters can be successfully reproduced, and the treatment applied in any part of the world where a physician will take the trouble to learn and a patient consent to obey.

In New York City a considerable number of physicians are applying the physical treatment of heart disease, and by their control of their patients' mental and physical hygiene obtaining results of a high order. The treatment in New York has been carried out successfully many times, and depends upon proper surroundings and intelligent appreciation of principles. It is not necessary to take a long journey if for the time being the patient will put himself entirely under the care of his physician, or, if he cannot do that, will put himself as much as possible under the care of his physician and expect so much less benefit.

I once heard of a man who, when he took his vacation, said "good-bye" to every one in

the part of the city in which he worked, and then traveling up-town a little way, settled down in new surroundings and enjoyed, as he thought, as much novelty as if he had gone to another city. I have had patients in New York on the upper floors of the St. Regis or Plaza Hotel who, because they chose to be so, were as much isolated as if they went to Germany. They had their Nauheim baths artificially prepared and took their exercise according to direction in Central Park.

The same is true of St. Luke's Hospital, where there is a beautiful view of river and city, and where the spirit of a combat with disease and the diagnostic and therapeutic resources are far superior to any health resort. Any one who has been to many of the foreign baths would recognize in the bath room at St. Luke's, the same appliances as were found everywhere. It needs but a few German decorations to look like one of the thousand bath rooms at Nauheim. All writers acknowledge that the chemical part of the problem of reproduction of the waters has been overcome. I cannot do better than to quote from Dr.

Thorne's book on "The Schott Method of the Treatment of Chronic Diseases of the Heart" as to the artificial baths.

"It is necessary here to state that it is not claimed that these waters are unique in their therapeutic influences; on the contrary, from the earliest days, Prof. Schott and his brother have insisted that similar, if not indeed identical, effects may be derived from baths artificially prepared so as to resemble the Nauheim waters in their principal mineral ingredients. Thus it is recommended that the treatment should commence with a 1 per cent. solution of chloride of sodium, and that the strength should be gradually raised to 2 or 3 per cent. For increasing the cutaneous excitation, chloride of calcium is the salt to be relied on. The initial strength of the bath with regard to that ingredient should be 0.2 per cent., approximately that of No. 7 spring, and, by increasing additions, it may be raised to 0.3 per cent., that is to about the strength of No. 12 spring, and eventually to 0.5 per cent. Such varying degrees of concentration may be obtained by the proportional use of the crystallized Nau-

heim bath salt, of the mother-lye or of calcium chloride, and of Mediterranean sea residue, and of calcium in the proportions necessary for the preparation of initial baths, together with traces of bromides and iodides."

For the production of carbonic effervescence the action of hydrochloric acid on bicarbonate of soda may be relied on. As a state of chemical purity is not required by the circumstances of the case, the articles of commerce are sufficient for the purpose.

To each bath of fifty gallons, add 10 to 20 lbs. of sodium chloride, and 1 to 2 lbs. of calcium chloride may be added. A patient is enabled to take a saline bath of this density at a low degree of temperature, and from two to four saline baths should be given before the effervescent series. The effervescent bath with a temperature above 90 is practically useless. As the patient becomes accustomed to these baths, the temperature should be lowered. That is, starting the first bath at a temperature of 90, then as the series progress, gradually reduce the temperature of the water to 60 degrees F. After the sodium

chloride and calcium chloride have been dissolved, the bath is ready for the artificial effervescence and to produce this, the following table suggested by Dr. Ralph Grace should be followed:

	Sodium Bicarbonate.	Hydrochloric Acid.
No. 1..Mild.....	10 oz.	9 oz.
No. 2..Medium.....	18 "	12 "
No. 3..Strong (Sprudel strength)	28 "	24 "

The sodium bicarbonate should be dissolved in water and mixed with the salt water bath. The hydrochloric acid is then measured and poured on the surface, distributing it equally over the entire bath. Effervescence begins at once, and the patient should be ready to step into the bath immediately. The tub should be of sufficient length so that the entire body may be covered. Different sized foot-rests may be put at the foot of the tub, so that persons of different heights may rest their feet against it, allowing the bath to envelop them to the chin.

The time of the bath is usually 10 to 12 minutes, but should be measured for the needs of each particular case.

A convenient way of producing an artificial Nauheim bath is by the use of Kny Scherer's Prepared Tablets. After the saline bath has been prepared as described, the acid tablet and the alkaline tablet are placed together at the bottom of the tub. Four pairs of tablets are usually used, two placed at the bottom of the tub under each shoulder; the other two placed at the bottom of the tub about at the knee. As soon as the tablets are submerged, effervescence takes place and the patient should be ready to step into the bath, or, better still, the patient is fixed comfortably in the bath and pairs of tablets distributed as described. The strength of the bath can be increased by using more of the tablets.

I do not underestimate the difficulties of carrying out a cure in New York City. Yesterday I saw a lady who was suffering from just the kind of condition that is most benefited at Nauheim. She had lived too generously as to those things which enter the stomach. She was under a tension that comes to those who suffer from a mania for amusement, never being comfortable unless under

some excitement, and she had developed a dilatation of the heart, accompanied by irregularity of force and rhythm. When the heart was examined it was easily ascertained that the closure of the valves was incomplete.

I saw this patient first three weeks ago, when she was not so badly off as she is at the present time, and advised her that what she needed was a modified Nauheim-Schott treatment. All the arrangements were easily made. I had a skilled operator, trained in Nauheim itself. The patient was living at a hotel where I have frequently carried out successful treatment, and the patient at the time seemed willing. I have followed her up as best I could, but yesterday when I saw her I had to tell her frankly that she was worse than when I first saw her. She had not followed the spirit of the advice that I had given her. She had attended a luncheon every noon, a bridge party every afternoon, a dinner every night, with a theater party and a supper later; and yet in the same hotel, within a year, I have conducted a perfectly successful Nauheim cure in a woman who came from another state for

that purpose, using Central Park in the morning for exercise, limiting social engagements by the frank statement that she was undergoing cure and did not wish them, and entering duly into the spirit of the cure just as the people at Nauheim do through the influence of their minds upon each other. This patient was more benefited in New York than she was by a subsequent visit to Nauheim.

Another reason that makes it difficult for a home physician to conduct a satisfactory cure is the attitude of the patient who has always looked to his physician to prescribe a drug that will relieve him of his symptoms, or that from which he is suffering. A person is slow to accept from his own physician the statement that he is suffering from a condition of the heart and blood vessels that will require a radical change in his mode of life preceded by a systematic course of treatment. When a patient goes abroad for a cure the first act when he arrives at Nauheim, or wherever he goes, is to engage a physician to conduct him through this cure. The physician is expected to confirm the diagnosis and opinion of the

home physician that the disease exists, and the cure is indicated, but his main work is in directing the baths, exercise, diet, rest and recreation. The cure physician has an immense advantage in that the question of work does not come in. Then again the cure physician gets a patient where his mind has been made up to take a cure.

In New York we stand in the same relation as the cure physician to those who come to us from other cities to be treated for heart conditions. Our greatest difficulties are with the New York people themselves. But one need not leave New York to get the benefits of a change of environment. It is easy enough for the New York patient to go to a hospital or a hotel,—and arrange to give up three to six weeks to having the circulation put in order by a suitable course of treatment.

The organs of the circulation very much resemble an intricate machine, the proper working of which depends upon a proper distribution of tension throughout its parts. When the tension of the blood vessels is too high and that in the heart too low, we

have the worst combination possible. When the tension in the heart is high and the blood vessels low we have alarming symptoms, but except in extreme cases little danger. When the tension in both the heart and blood vessels is low, and when this condition is chronic, we have a condition of circulation of low tension, which I have recognized in quite a number of individuals, and been able to relieve much mental and physical suffering by its proper management. The condition, however, is not dangerous.

It is very difficult indeed to explain the nature of the Schott movements to those who have a deep-founded belief that the only two reasons for exercising at all are, on the one hand, to develop the muscles, and on the other hand, to promote a proper combustion and elimination of various elements that enter into the nutrition of the body; however, the Schott movements have an entirely different function. They have to do with the regulation of the muscular tone of the heart and arteries. I have sought elsewhere to explain this action, and I will not repeat here except to say that it

has in a great measure to do with regulation of the tone of the affected muscles. The movements are distinguished from other movements and governed by rules that are altogether different. The movements are performed slowly and regularly. No movement is repeated. Each movement is followed by an interval of rest. If the patient shows the slightest acceleration of breathing, or shows any signs of exhaustion, the movements are stopped. The patient must breath regularly. The principle of the movements is the gradual overcoming of resistance by a group of muscles, which, when accomplished, is not repeated, new groups being taken in succession. When this principle is understood the exact order in which the muscles are approached is not of importance. The movements must be administered by a skilful operator, who is familiar with the tendency of patients with heart disease, and no purely mechanical system can take the place of the operator.

The Nauheim-Schott Treatment can thus be given at home with marked benefit, or even with results equal to those abroad, but when it

is possible, the same results are reached with less labor when the patient can be removed from home surroundings. Failing of the possibility of going to a "Kur" resort, the patient must be surrounded with as many of the conditions as possible, and treated by attendants who know the spirit of the method as well as its technical details.

While heart disease of the more pronounced type is the usual field for the method, it is useful in all disorders of the circulation. It has proved invaluable in sustaining the heart during pregnancy, and improving the circulation of invalids from many various causes.

CHAPTER VI

TYPICAL CASES WITH FAVORABLE CLINICAL RESULTS REPORTED IN AMERICAN LITERATURE

In approaching the report of clinical results, as illustrating his theory, and the results of the physical methods of treating co-ordinate heart and blood vessel disease, the author is met by the difficulty of choosing his attitude. Should he stand in the position of a judge, and sum up all the evidence presented and give an opinion, or should he stand as an advocate for or against the method described? In this instance it has seemed best to seek out the cases in the American literature at hand, which best illustrate the favorable result of the treatment, only using those cases that the author is able to parallel in his own experience.

The gravity of heart disease does not need to be impressed upon intelligent readers. All patients are not equally susceptible of benefit-

ing by a cure, but the number who can be benefited is much greater than is generally supposed. It goes without saying that a treatment so powerful for good demands for its application skill that can only be gained by experience, coupled with a strength of character on the part of the patient and physician, that will not demand or grant any departure from the individual plan suited to the particular case.

In Nauheim much clamoring is heard of patients who are impatient for stronger or more frequent baths, and who cannot realize that the mild tone-regulating resistance exercises are what they need. The following abstracts of papers are chosen as best suited to the requirements of this book, but no doubt important papers have been overlooked.

Dr. Robert H. Babcock of Chicago, writing in the Journal of the American Medical Association some years ago, said in part:

THE SCHOTT METHOD OF TREATING CHRONIC DISEASES OF THE HEART BY BATHS AND GYMNASTICS.—We hear nowadays about the wonderful progress made by modern surgery. In contrast thereto the advances along

the lines of internal medicine, particularly of therapeutics, appear insignificant, and their actual importance is likely to be underestimated. Nevertheless, if the history of therapeutics be read aright for the past hundred years, many suggestions will be found that mark the beginnings of new eras in the art of healing. Such an epoch, for example, began with the introduction of digitalis in England by Withering toward the end of the last century. No single drug, perhaps, has rescued more lives from an untimely grave than that incomparable and indispensable remedy. Yet immeasurable as are its capabilities, there are well-recognized limitations to its usefulness. Accordingly, many attempts have been made to discover a substitute free from its objections, or some means of supplementing its deficiencies. As yet, no such agent in the form of a drug has been found. But, startling as the statement may sound, such a means of replacing and supplementing digitalis has at last been devised in the therapeutic method which is the subject of this paper. And the honor of developing it, if not discovering it, belongs to two

German physicians, Dr. August Schott, now dead, and his surviving brother, Dr. Theodore Schott.

Case 1. This is the case of the writer. Early in the last decade the writer's attention was drawn to this system of cardiac therapeutics by an article from the pen of Dr. Theodore Schott which appeared in the Berliner Klinische Wochenschrift, and which occasioned his resolve to some day visit Bad-Nauheim for the purpose of personal investigation and treatment. Circumstances did not prove favorable to the fulfilment of this design until this past summer. June 24th, last, he arrived in Bad-Nauheim, and presenting himself at once to Dr. Schott, he was examined and subjected to treatment.

The writer is 42 years of age, weighs 147 pounds, and is five feet eight inches in height. Family history is that of strong predisposition to chronic arteriosclerosis and consequent cardiac disease, on the father's side, but on the mother's side no hereditary taint of any kind. Patient had scarlatina at 3 years; gastric fever at 19; typhoid fever at 31; never any articular

rheumatism or pneumonia. At 31 years of age, history of cardiac over-strain, that was repeated several times in the next ten years. Six years ago the opinion was expressed by one of the ablest medical men in this country that the difficulty was an organic mitral affection, stenosis predominating. At the date of Dr. Schott's examination the symptoms were moderate dyspnoea and pain in the precordia upon walking; pulse small, very weak and rapid on moderate exertion, but not intermittent; countenance cyanotic and sallow; digestive disturbance pronounced; urine scanty; no appreciative enlargement from passive hyperaemia of the liver or spleen; no edema. Physical examination revealed all the signs of dilatation of the right ventricle, with moderate dilatation of the left, the apex beat being situated 1 cm. outside of the mammillary line, but in the fifth intercostal space. Upon auscultation the first sound at the apex was preceded by a short rough murmur which terminated in a short systolic whiff; the second pulmonary sound was very accented and split; a diaphragmatico-pericardial friction sound

was audible over the lower border of the right ventricle. There was no evidence of chronic arteriosclerosis. In repose, the pulse was about eighty in the minute.

Treatment by means of baths was commenced the following day, June 15.

GENERAL REMARKS

Careful percussion of the heart before and after the seventh bath showed slight but unmistakable contraction of its limits, about 1 cm. at right border.

8th Bath, July 4th. The intermittence of the pulse may have been due to the bath following too soon a hearty breakfast; but for two or three days past the gymnastics have caused oppression in the precordia and the pulse has been small and weak on exercise.

10th Bath, July 7th. I note that venous congestion is becoming less visible, and this bath produced a decided feeling of comfort in the chest. Shortness of breath is greatly improved and the action of the kidneys is remarkably free.

12th Bath, July 9th. Notwithstanding the discomfort due to gymnastics for the past week, the precordial dullness is certainly diminished at the right, and apex beat is permanently within the nipple line.

13th Bath, July 11th. Careful percussion before and after bath showed a retraction of the right border of 1 cm.

16th Bath, July 15th. For the past day or two I note marked lessening of all symptoms, and the heart has nearly returned to normal size.

17th Bath, July 16th. Dr. F. Herrman of Charkoff, Russia, made the following observations:

Before bath. Percussion. Right border 1 cm. outside of right parasternal line. Apex 5 cm. inside mammillary line and in fifth interspace. Auscultation. No audible murmur at apex; first sound distinct; slight pericardio-diaphragmatic rub below lower border of right ventricle to left of epigastrium; slight accentuation of second pulmonary sound. Pulse 100; not very strong. The rapidity and weakness of the pulse this morning was due to springing

suddenly out of bed, and to walking and talking to Dr. Herrman before the bath.

After Bath. Standing, and before dressing. Right border 5 cm. outside of right parasternal line; and apex 1 cm. within left mammillary line. Auscultation. No murmur at apex. Both sounds are fuller and stronger. Second pulmonary a little more accented; second aortic equally as strong as second pulmonary; pericardial rub a little more distinct.

After walking leisurely back to room and remaining in bed for ten minutes, pulse 65 and of good quality.

19th Bath, July 19th. Dr. Herrman examined me again this morning and verified the changes in the heart noted after bath No. 17. Except that the pulse is a little weaker this morning, there are no ill effects from my fatiguing trip to Frankfort yesterday. Dr. Herrman examined my heart after I got to bed and pronounced the first sound prolonged but free from murmur.

July 24th. Am sensible of increased strength of the heart's action; its rate is not so greatly increased on getting out of bed as formerly,

and walking up the gentle ascent to Concert Garden yesterday produced no shortness of breath, only a slight feeling of fullness in the precordia; pulse rate was not very fast.

At Dr. Schott's examination on the 21st he was astonished at the change for the better, pronounced the heart of normal size; the first sound prolonged and free from murmur.

July 25th. Examined again by Dr. Schott last evening; found no murmur and heart of normal size; his observations confirmed by myself to-day.

25th Bath, July 27th. Bath produced agreeable sensation of warmth, alternating with slight coolness as the current swept up along the body. The heart sounds after bath intensified and clearer. I feel a little bit light-headed. The CO_2 was fanned away from my face to prevent inhalation. Before close of bath a sensation of fullness and pressure in lower part of precordia, which last during the walk home.

26th Bath, July 28th. First sound at apex less prolonged and clearer than it was before bath. Second aortic sound fuller and stronger.

27th Bath, July 29th. The day was cold and rainy. Less gas in water than usual, nevertheless, felt as if I inhaled gas.

After six baths had been taken, that is, at the end of a week's treatment, the pulse pressure, as recorded by Basch's sphygmomanometer was 105 mm. of mercury, the normal being about 130. At the end of five weeks, after balneological and gymnastic treatment, the pulse pressure had arisen to 165 mm.

Since leaving Bad-Nauheim, August 2d, the writer has not been able to keep up the gymnastics, and his pulse is not as full and strong now as then. But his heart remains normal in size, his previous symptoms have not returned, and he considers himself in excellent health. He intends, however, to supplement the treatment he has had by another course of baths prepared artificially, and to resume the exercises.

Case 2. July 16th. Male 18 years. American. History: Measles as child, also diphtheria. Muscular rheumatism in legs and, especially of late, across shoulders. Formerly given to much swimming and to holding

breath under water until head felt as if "it would burst." Fond of violent exercise. Physical examination before bath, standing:

Percussion. Right ventricle border on right, parasternal line; apex beat fifth space close within mammillary line. Auscultation. A pure mitral systolic murmur at apex, accented second pulmonary sound. Pulse 92, regular, soft.

In bath, Spring No. 7, 32 C., 2 liters "Mutterlauge." Duration fifteen minutes. Pulse on getting in 92; pulse after three minutes, 100 and fuller; pulse after nine minutes, 96, quality still better; pulse after twelve minutes, 92, tension still greater; pulse after fifteen minutes, 92.

Examined immediately after bath. Standing. Percussion. Right border 1.5 cm. within right parasternal line. Apex beat 1 cm. within nipple line and impulse stronger. Auscultation. The murmur softer. Second pulmonary sound stronger. Second aortic sound also stronger.

July 26th. Bath: effervescing. Duration 12 minutes. Temperature 30.5 C. Examina-

tion before bath. Right border is a shade outside parasternal line. Apex beat 1 cm. inside mammillary line. Pulse, standing before bath, 96, small and compressible. Pulse, in bath three minutes, 104, but fuller. Pulse, in bath six minutes, 94 and full, after sitting more upright. Nine minutes, 92, not quite so full and a little irregular in force and volume.

In bath, palpation of apex beat detects a slight thrill and the impulse is more diffused, being extended into the sixth space and is a little less powerful. Pulse, 12 minutes, 92, and full but rather compressible. After bath. Apex beat a little more toward the median line, and a little less pounding. First sound strong and no distinct murmur.

" The foregoing observations corroborate the statement made concerning the effects of the baths and gymnastics. In Case 1, it will be seen that the pulse became slowed during bath from two to fifteen, most commonly six to ten beats in the minute. The only exception was in the case of the effervescing current bath, and that was probably because it was too stimulating. In the second case there was no

slowing of the pulse although the quality was improved. This patient was not one of Dr. Schott's, and the writer became satisfied from daily observation of that patient that the physician did not keep a sufficient watch of the effects of the baths, but prescribed stronger ones than the patient was prepared to take; or that there was something in his daily habits which defeated the end sought and which should have been corrected. This confirmed me in the belief that patients undergoing this treatment should be carefully and frequently observed, as is done by Dr. Schott, even at the risk of unfavorable criticism."

In the Boston Medical and Surgical Journal, May 17, 1906, Dr. Francis P. Kinnicutt said in part:

"The opportunity has been afforded me of studying the Nauheim treatment under specially advantageous conditions during the past two years. I took a five weeks' course of treatment in Nauheim in the summer of 1904 and in 1905. During these visits, besides my personal experience of the treatment, I was granted courteous and full opportunity by

Professors Theodore Schott, Heinemann and Groedel to see their most interesting cases and to examine the patients to whatever degree and with whatever frequency I desired. As the result, I have been able to form a reasonable opinion of the effects to be expected in cases suitable for what is known as the Schott method of treatment, which is the combination of resistance exercises and baths, and of the contraindications for its application.

" A series of very careful observations in regard to the effect of the bath upon the pulse were made by me in my own person during my visit in 1904 and confirmed in the summer of 1905.

" The pulse was taken before undressing, and any increase in frequency during the act was allowed to subside before immersion. After one and one half to two minutes of immersion, either in the simple brine or in the effervescing brine baths, the frequency was invariably reduced from 8-10 beats, if the pulse was 76 or more before immersion, and its volume was notably increased; if under 70 before immersion, the reduction did not exceed 6 beats. The

pulse rate is usually accepted as a guide for the length of the bath. Its duration should invariably be within the limits of causing any increase in the frequency of the pulse. In my own case, at the beginning of the treatment, the pulse-rate began to quicken after ten minutes; later in the treatment, an increase in frequency occurred only at the end of a twenty minute immersion. The reduction in the pulse-rate was fully maintained during the subsequent period of rest.

"The evidence of vaso-dilatation of the surface of the vessels was always well marked, and with it there was a sensation of general and very agreeable warmth following the first sensation of coolness."

Prof. H. Newton Heinemann, in a pamphlet published by him, said in part:

In 1887 I first visited Bad-Nauheim, and for ten successive summers spent from two to four months at the resort. The opportunity to investigate the treatment resulted in the papers read before the New York Academy of Medicine in 1890 and in 1896.

To speak of the improvement in detail:

Blood state: Haemoglobin is increased and with it more fully developed red blood cells appear.

Heart: That portion of the heart which has yielded to dilatation is likely first to receive the impulse to recontraction and to hypertrophy of its tissue. Thus we have improved contraction of the weakened portions of the heart and finally a certain diminution in size in some cases, provided compensatory hypertrophy does not finally replace the previous area occupied by the dilated heart muscle as required in some instances. Thus, while the tendency is to general diminution, inasmuch as better contraction implies this, yet this does not go on in any steady manner, diminutions and relaxations or enlargements succeeding each other, the dilatations or relaxations becoming less; and ultimately the final result as to the heart's size is determined, as already said, by the amount of hypertrophy induced and made necessary to effect permanent improvement.

Internal Viscera: They are relieved of their congestion and are thus found smaller. In

fact, in making my examination of the heart at the outset, the condition of the viscera, particularly the liver and spleen and kidneys, often give me a better indication of the heart force than the direct examination of the heart, and this holds true provided disease of the liver can be excluded. In this connection, the frequent examination of the urine must not be overlooked, for the strength of the bath and the continuation of the treatment are often determined and measured by the condition of the kidneys. While a few casts or a little albumin of a secondary character do not contraindicate treatment, yet increasing albuminuria is always a warning sign for prudence, if not discontinuance of treatment.

Conclusions.—No form of treatment in the range of medicine, which is applied to chronic disease and often apparetly hopeless cases, for whom distinguished skill and money has done everything available, can show a larger number of improved patients whose energy has been restored in various degree and whose lives have been prolonged for indefinite periods of years.

X—— aged 62 years, clergyman, widower, came to Nauheim, May, 1898. He was of gouty ancestry, moderate in the use of alcohol and tobacco, had no gout or rheumatism, but has passed through the diseases of infancy. He was never robust, but always active; and had hepatic attacks since youth. Three years ago he had influenza, followed by aggravation of his old-time dyspnoea and cardiac palpitation so as to prevent moderate stair climbing. He went South, and improved, but in a year's time matters grew worse so that the dyspnoea was constant upon the slightest exertion. He had attacks of angina, associated with severe abdominal pressure and a sensation of cardiac expansion and of hot water flowing into the heart, and he was often unable to walk. Gastric and liver troubles were aggravated of late. He was often threatened with syncope, which he has had periodically for years. Now he is anaemic, pale and jaundiced; has a coated tongue and sluggish bowels: complains of dyspnoea, palpitation and cardiac sensations as above; is liable to syncope, flatulency and gas-

tric overdistention. Examination reveals advanced general arteriosclerosis. The heart sounds are muffled, almost inaudible, dilatation is marked, particularly on the right side; there are moderate old hypertrophy and loss of compensation. Beats, standing, 134; lying down, 116. He has considerable emphysema and an old bronchitis. Urine, specific gravity, 1,022; contains a mere trace of albumin and biliary coloring matter, otherwise negative. Diagnosis, arteriosclerosis, myocarditis. The diagnosis was identical with that of Balfour and Finlayson, of Glasgow, who in October, 1897, recognized a weak, degenerated and dilated heart. Within forty-eight hours after the first bath was given, the pulse had gone to the opposite extreme of 48 to 60, according to the position of lying or standing, though the slightest exertion would send it above 100.

A few days later the patient again had repeated threatenings of his old syncope. Later the pulse, which at first could not be counted on account of the reduplication and irregular rhythm and intermittency and rapidity, re-

mained with few exceptions during the day sufficiently slow and sufficiently regular to be accurately appreciated, and it now became alternately bigeminous and trigeminous in successive beats, with a tendency to equalization of strength of beat.

Before leaving Nauheim the patient was warned to forego preaching and parish work and to spend the winter in the South. He persisted, however, in facing the rigors of the Scotch winter, with a break of a few weeks, and continued his work.

Latterly, January, 1901, the patient reports himself well, having gone through a serious carriage accident in which he broke an arm and had some severe sprains, yet without visible effect upon his heart as reported by his doctor.

Balfour and Finlayson considered the case one of grave import, and with but little chance in 1897.

Of a case of mitral stenosis in a woman (July, 1899), who had suffered since youth and who latterly had complained of the usual praecordial pains, dyspnoea, harmoptysis, and

in whom drugs failed to give relief, her doctor, writing some time after her relief, said:

1. There is improvement in the general appearance and nutrition.

2. Ability to perform muscular exercise has returned and increased.

3. The physical signs are improved:

(a) The tone of the ventricular wall, as evinced by the condition of the apex beat, is good.

(b) The presystolic murmur is better heard, owing to better muscular power of the heart.

(c) The cardiac action is regular. This improvement has been maintained to date.

Dr. G. L. Peabody of New York said in a paper written some years ago:

"I am convinced that its power in heart cases justifies us in giving it very serious consideration. It is certainly a great deal to be able to relieve distressing and even dangerous symptoms and to enable people to work who have been led to believe that their days of usefulness are over, as it is also to enable those

who are working with undue fatigue and weariness to accomplish their daily tasks with less effort or even with pleasure."

Patients intending to go to Nauheim should consult those who have been there as to the journey, etc.

Dr. Solomon Solis-Cohen, speaking before the Philadelphia County Medical Society, on The "Schott Method" of Gymnastics In The Treatment of The Heart, on Jan. 27, 1897, said in part:

The physiologic mechanism by which this (the remarkable results he had described) is accomplished is in brief that the gently-resisted movements, carried out as described and demonstrated, dilate in turn peripheral vessels in every section of the body, and distend the lymph-spaces, and thus by employing for therapeutic purposes the pumping action of the muscles and relieving the veins, secures increase filling of the arteries and better emptying of the heart. In other words, by increasing the volume of circulation in both arteries and veins, by better filling of the vascular system generally, including lymph-channels and lymph-

spaces, and thus affording a much larger peripheral area for the blood, the left heart is better emptied by invitation of the blood out of the capillaries, the arterioles, the larger arteries, the aorta; and back pressure upon the auricle being relieved, the right heart is relieved through the pulmonary circulation, and thus the veins are still further emptied, the congested liver often markedly diminishing in size. In effect the peripheral pump is substituted for the central pump of the circulation, and the latter, being able to contract upon the lessened quantity of blood, now becomes able to do its work once more, and all this without the use of any drug. When necessary, of course, the exercises may be aided by judicious medication.

I have here some careful notes of the case before us which have been made by Dr. West. It will not be necessary to read them in full. The patient, a widow, fifty-eight years old, came under observation at the Philadelphia Polyclinic on the second of October, 1896; having had influenza, of three week's duration, a year before, followed by dry pleurisy. For

the past five years she has been subject to attacks of dyspepsia and nervousness. A good deal of mental disturbance had recently made her more nervous. In addition to the dyspeptic symptoms, she sought relief for dyspnea, constant, and increased on exertion, headache, vertigo and continuous palpitation of the heart, which gave rise to a sound heard in the left ear. There is also at times a sensation of "stoppage" of the heart—what my friend and colleague, Dr. Riesman, has termed "paulocardia." While in high altitudes (Colorado) she was subject to fainting spells. On examination the heart was found dilated and displaced to the left, the apex-beat being in the sixth interspace one inch to the left of the nipple. Both sounds were feeble, the second being relatively accentuated. There was a faint, harsh systolic murmur, heard best at the aortic cartilage and feebly transmitted into the neck. The pulse was small, feeble, its rate 96, with the patient standing, the artery somewhat hardened. There was occasional intermittence. Small quantities of albumin and granular and hyaline casts were found in the urine. There was no edema.

Under the treatment the heart has receded, until the apex, from being one inch to the left of the nipple, is now permanently half an inch to the right of the nipple; and from the sixth interspace it has receded into the fifth. The sounds are stronger, the first markedly so, and the murmur is more distinct, though perhaps softened in quality. Intermittence has ceased, The artery is larger, the beat fuller and slower; the record of to-day being 68 with the patient seated. The sphygmographic tracings which I exhibit, and which were taken, respectively, before, immediately after, and ten minutes after the exercises on a number of occasions, the pressure being but slightly varied, as recorded, and the instrument and the observer being the same in each instance, show the great improvement in the fulness of the arteries and in the character of the beat. For instance, at the beginning of treatment there was scarcely any elevation of the lever, and the tracing is markedly that of rigid unfilled arteries—the tidal wave being wanting. This may be contrasted with the recent tracing in which the pulse is beginning to resemble a normal pulse, the elevation being, however, less than normal, and

the tidal wave still obscured; for, of course, we have not given the patient new arteries. The patient has lost her unpleasant symptoms, except that there is still a slight noise in the ear. In especial she has lost the extreme depression and dread of suffocation which were the most distressing features of the case.

The albumin has disappeared from the urine, and I find that similar cases are also recorded by Dr. Schott and Dr. Thorne. In another Polyclinic case, one of mitral regurgitation and interstitial nephritis, the albumin was markedly diminished, but did not entirely disappear. However, the patient felt so much better, her edema having gone, and her dyspnea being relieved, that she declared she was well and went back to work. For this reason I have been unable to bring her before you this evening. In conclusion let me say that this is but a preliminary communication to call your attention to the subject; in the effort to atone as much as possible for my long neglect of the method, by doing my share to make its merits more widely known.

From reading and my limited observation, I believe the Nauheim system to be one of the greatest advances in the line of therapeutics without drugs that has yet been made. It is more troublesome than the writing of prescriptions, but in suitable cases, much more effective.

Dr. Albert Abrams of San Francisco, writing in the Medical News, says:

"Clinicians no longer regard the Schott Treatment in the light of an experiment. They concede its value in properly selected cases of myorcardiac disease."

Dr. Simon Baruch, in the Medical Record, says of the Nauheim Bath:

"Its great value in certain serious cases has been firmly established in the clinical observation of many physicians who cannot be charged with interest in the Springs."

In a paper before the New York State Medical Society in January, 1909, the author said in part:

Baths and Exercises in the Treatment of Abnormal Tension of the Heart and Blood Vessels *

Abnormal tension in the heart and blood vessels needs definition. By that, we mean an increase or diminution of the normal continuous partial contraction of the muscular coat of the heart and blood vessels. This increase or diminution may be general and uniform or partial and irregular. There may be, and often is, increase in one part of the cardiovascular system and diminution in another part. These alterations of tone may or may not be accompanied by symptoms.

The tone of the muscular coat of the blood vessels is measured by the habitual degree of contraction of the vessels. This is in turn inferred by the facts observed by the direct evidence of an examination of the vessels themselves, by symptoms, and from so-called blood-pressure measurements.

The tone of the heart muscle is likewise determined by direct examination, by symptoms,

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and by an analysis of the findings of instruments to determine the condition of the activities of the circulatory organs in general.

The process of feeling the pulse is too old a procedure to be discussed in a brief paper, nor can we enter into the subject of auscultation and percussion. The measurement of the quantity known in recent clinical medicine as blood pressure is of much importance. In the laboratory we mean the pressure of blood as measured by connecting the blood current to a pressure gauge. In clinical work, we mean the force required to obstruct the pulse wave in the arteries, when applied in the form of elastic pressure.

In recent practice the band compressing the brachial artery has come into general use. The elastic pressure is applied and measured in various ways. For my own use, I have devised an instrument consisting of the usual arm band, but I make pressure by fluid falling from a height through a tube from a flexible rubber bag. I measure and apply the pressure at the same time by regulating the height of the bag, and I read the pressure at the level of the

brachial artery and the middle of the arm band from numbers placed on the tube.

Last year I showed the society an instrument on this principle in which water was used, but now I am substituting a solution of cadmium borotungstate. By using this solution, that is much heavier than water, I can obtain sufficient elevation without the use of a string and pully. I carry this instrument in my pocket, and make a practice of measuring the blood pressure almost as often as I feel the pulse.

Hypertonicity of the blood vessels and loss of tone of the heart muscles is found in a large number of cases of broken compensation in valvular disease. The same thing is found when toxic substances circulate in the blood, and while damaging the heart muscles, at the same time cause a demand for high blood pressure to bring about elimination through the kidneys. Loss of tone in the heart muscles also follows as a terminal result of degeneration of the blood vessels and hypertrophy of the heart.

Let us trace a few typical cases of disordered vascular tone. A patient suffers from vascular disease, causing a demand for a large amount

of work on the part of the heart. This in turn leads to hypertrophy of the heart, and if everything goes well, the patient has no symptoms. However, if anything interferes with nutrition, or if the heart is strained by any great exertion, there results a loss of tone in the heart muscle leading to dilatation. This leads to a tendency to loss of pressure in the blood vessels, and that in turn to a contraction of the vessels in an attempt on the part of nature to make up a sufficient pressure. So there comes about a condition of loss of tone in the heart and an overtone in the blood vessels.

Next let us consider what happens in a toxic case. There may exist for a long time a condition of fermentation in the intestines, causing absorption into the blood of those substances that are typified by indican. After a time the heart muscle becomes involved, and perhaps the muscle of the blood vessels also; then there results a loss of tone in both heart and blood vessels, and we find the patient suffering from dilatation of the heart was a soft systolic murmur, a low blood-pressure reading, and many disagreeable symptoms that go with a

poor circulation; but later in such a case there may develop a degeneration of the blood vessels with a tendency to spasm, and the kidneys are apt to suffer. Indeed, one of the earliest symptoms of such a case is albumen in the urine.

Now, let us trace a case of nervous origin. This occurs in persons carrying a great strain from anxiety and mental overwork. The mental tension results in an exaggeration of the natural tone of the blood vessels. This in turn leads to hypertrophy of the heart, and degeneration of the blood vessels. If any of the causes of loss of tone in the heart muscle exist, there may be cardiac dilatation. The ultimate termination of such a case, if the heart escapes, is apoplexy or fatal kidney disease.

It is in correction of these conditions of abnormal tone that the Nauheim-Schott treatment is worthy of study. This treatment consists of a system of baths and resistance exercises. The baths are ordinarily strong solutions of brine with calcium chloride, and other minor ingredients. Less often they contain noticeable quantities of carbonic acid gas,

and occasionally they are used as they come directly from the spring, with a large quantity of gas in them. The patient is immersed in this form of bath from 5 to 15 minutes, and is then rubbed dry with hot towels, and is instructed to rest quietly for a time. The whole procedure is very simple, though the effects are striking. The Schott movements consist of a form of gymnastics in which a series of motions on the part of the patient, designed to bring into play all the muscles of the body, are gently resisted by an operator, so that the tonus of the muscles is voluntarily increased without the existence of anything corresponding to exercise in an ordinary way. The Nauheim-Schott treatment involves a good many other things beside the baths and exercise. It involves diet, rest, out-of-door life, change, travel and diversion. My own impression is that the exercises are more specific than the baths, though no one element is the essential one.

The treatment is carried on in Germany with a beautiful elaboration of detail. The baths are built and controlled by the state, and the

town of Nauheim is carefully governed in the interest of those who come for treatment. The baths and exercises act, as I believe, through their influence on the tonicity of the blood vessels. The result is a lowering of a general overtone of the heart and blood vessels, the elevation of the general undertone of the heart and blood vessels, or the restoration of the tone to the heart, and the relaxation of the overtone of the blood vessels when there is a lack of balance between these two parts of the circulatory system.

In America the principles are successfully applied by many heart specialists, who have grasped the essential principles of the treatment.

THE END

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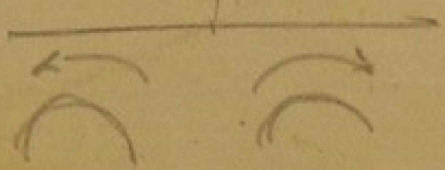
Food for movement



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