

DR. FRANK BILLINGS, Chicago: What has been said regarding cardiovascular changes, agrees with the statement already made that the cardiovascular or vascular changes with the hypertrophy of the heart are very important things to consider in blood-pressures. Sometimes in our ignorance the elevation in the blood-pressure is ascribed to a toxemia; there seems to be nothing else which will describe it. However, toxemia has been recognized in many other conditions in which there is an increase of blood-pressure; some vasomotor process such as is exemplified in the phenomena which appear in hyperthyroidism. In the early stages of this disease there is a blood-pressure of 180 or 200, and this is before the disease has progressed to changes in the cardiovascular system. This must be the result of a toxemia, something which produces overfull blood-vessels. As Dr. Wells stated in relation to the management of such conditions, the existence of a permanent blood-pressure is in a sense conservative; it is Nature's method.

We must consider hydrostatic pressure, but there is another condition, toxemia, which we must not neglect. I agree with Dr. Lee that there are many other things that cause hypertension, such as cardiovascular changes and other changes referable to the kidney. I have watched many cases in the clinics, many that have gone to autopsy; I have seen patients suffering from toxemia without apparently any cardiovascular changes; but at autopsy the kidneys were found to be practically worthless, or functionless.

Just one other word. I do not believe that we can say definitely that there is an exact dividing line between the pathologic and the normal in these cases. To say that 160 is the limit of health, or the point at which disease begins, I think is wrong. There are people of the very nervous type who, under certain conditions, such as overwork, worry, and the like, run up the point to 160, 170 or 180, even, and here we find associated the toxemia that goes with fatigue. When these people are treated with ordinary hygienic measures there is a lessening in the blood-pressure. I do not believe that we have any right to have a statement go forth that a blood-pressure of 160 or more really means, necessarily, disease.

DR. C. F. HOOVER, Cleveland: For the past few years I have studied the diastolic arterial pressure in all suspected cases of hyperthyroidism and I have yet to find a patient in whom there is an elevation of the diastolic pressure even when the systolic pressure is high. My attention was attracted to this point by cases with cardiovascular disease being referred to the surgical wards for operation on goiter which these patients happened to have. The goiters in such cases were merely incidental and were not the cause of the cardiac symptoms.

DR. CHARLES L. GREENE, St. Paul, Minn.: With respect to the findings in these cases of aortic lesions, in the cases that have been so ably described by the reader of the paper, if the cases were in fact aortic regurgitation, then what has been presented should not be included among the high-pressure cases. The experience of all of us who are doing this sort of work shows that we may get a very high systolic pressure, but for different reasons, as described by Dr. Hoover. With the Corrigan pulse we may find a high systolic pressure and a very low diastolic pressure.

DR. WALTER L. BIERRING, Des Moines, Iowa: I should like to ask the reader of the paper if any histologic examination of the brachial artery was made and compared with the condition of the other arteries in the body. It has become recognized that marked differences often exist in the pressure in the brachial and the femoral arteries, and it would be interesting to know if local changes in the blood-vessels could account for this difference.

In determining arterial pressure by the simpler method of palpation, it has also seemed to me far more satisfactory to palpate the femoral artery rather than the radial or the brachial, and by comparative tests one can make much closer estimates in this way with the findings of different forms of special apparatus used for this purpose.

DR. ROGER I. LEE, Boston: Only a macroscopic examination of the adrenals was made in these cases. No gross lesions were found.

Among these cases was one of syphilitic aortitis. The spirochetes were found in the walls of the aorta. Two or three other patients gave a history of syphilis.

Only rarely were histologic examinations of the blood-vessels made. The brachial artery was the one used, as a rule to ascertain the blood-pressure. The femoral artery was occasionally employed, but merely as a control for the brachial artery. But in the synopsis the conclusions were drawn from the results obtained from the brachial artery.

I agree with Dr. Billings in regard to setting a limit, or trying to set a limit between what is pathologic and what is normal; the limit of 160 was merely taken because we wanted some limit and 160 is generally regarded as being a fairly good dividing line. It is evident that the diastolic blood-pressure may be very variable in these cases; a further study will result, no doubt, in more satisfactory conclusions.

The cases studied include only one case of frank aortic regurgitation, and one case of aortic stenosis.

The primary purpose of my paper was to find out how great a rôle arteriosclerosis played in hypertension, inasmuch as the German schools have insisted on the close relation between hypertension and kidney lesions. It should be remembered that kidney lesions, however slight, may be sufficient to cause a high blood-pressure. It is certainly very difficult to balance the relative importance of the different lesions. One must think of the so-called latent nephritis, a name applied by the Germans. In this study I classified all cases having any kidney lesions under the head of hypertension associated with kidney lesions.

Another reason for my undertaking this study was that I wished to place hypertension on an anatomic basis so far as possible. While as yet few cases of hypertension have been recorded as the result of a toxemia, it is certain that soon many will be. Barker has reported a case of transitory high blood-pressure in a case of tabes with gastric crises. These cases must be carefully studied, especially in regard to the condition of the heart, kidneys and blood-vessels.

RESERVE RENAL CAPACITY IN CHRONIC INTERSTITIAL NEPHRITIS *

EDWARD F. WELLS, M.D.
CHICAGO

In the mid-course of chronic interstitial nephritis, with the secreting structures of the kidneys greatly reduced by degenerative and atrophic processes, more or less marked renal insufficiency is the rule. With the high-pressure circulatory balance well maintained, the urinary water flows in full or increased volume, the insufficiency being confined to an inadequate excretion of certain waste and superfluous determinable and occult substances which are deleterious to the human body, and which are ordinarily efficiently removed by healthy kidneys. It is probable that the most toxic and important of these are, as yet, demonstrable only by their effects. In the future, when methods shall have been perfected whereby these may be differentiated and measured, our problem will be susceptible of ready and accurate solution. For the present, and for our practical purposes, we are compelled to rely on the amount of urea, chlorids, phosphates and sulphates contained in the daily urine, together with the general and special symptoms, in forming an estimate of renal capacity. Notwithstanding the difficulties and inaccuracies attending such estimates under current conditions, it is my opinion, based on a fairly long and broad experience, that they are of sufficient diagnostic and prognostic importance to warrant their employment in the routine of general practice.

* Read in the Section on Practice of Medicine of the American Medical Association, at the Sixty-Second Annual Session, held at Los Angeles, June, 1911.

Many years ago I attended a man who was known to have had chronic interstitial nephritis for more than twenty years, during the latter of these accompanied by frequent and at times very severe attacks of uremia. For several years fairly full analyses of the urine were made once or twice a week, and at times daily for periods of from two to six months. These analyses showed the total solids and urea uniformly greatly reduced, the latter ranging from 3 to 12 gm. per day, with 8 gm. as an approximate average. At one time the daily excretions of urea averaged about 5 or 6 gm. over a period of several weeks, at the end of which the patient had a severe attack of uremia with most active maniacal excitement. During twenty-four hours of violent muscular exertion he passed urine which contained 36 gm. of urea. Following this observation it was noted that active, and to a lesser degree passive, muscular exercise regularly increased the excretion of urea, and approximately a like amount of such exercise always augmented the urea excretions to a corresponding degree; that is, up to from 10 to 12 gm. Later it was experimentally demonstrated that if lean meats were added to the diet, the urea excretion was further increased according to the amount of proteid ingested, up to 15 or 20 gm. This required about 300 gm. of meat. In this case it was clearly evident that beyond this proteid intake the urea output lagged behind. For reasons not material to our theme these observations, so far as the giving of meats was concerned, were omitted, but the employment of active and passive muscular exercises were continued with satisfactory results as an important feature of management. In this case the conclusion to which I had come, and which was shared by other physicians, namely, that the secreting structure of the kidneys were so largely destroyed as greatly to reduce the renal functional capacity, using the urea output as a measure, to far below the requirements of the system, and with a practical abolition of any reserve capacity, was demonstrably erroneous.

During the past ten years I have had frequent opportunities to pursue these investigations, with the result that a sufficient array of facts has been accumulated to warrant the deduction that, in the class of cases under discussion, the kidneys are seldom anatomically or functionally altered to such degrees as to preclude the moderate regular excretion of water, urea, chlorids, and other of the measurable constituents of the urine, and, on occasions of great and extraordinary stimulation, to show evidence of correspondingly increased functional activity, which may, with propriety, be termed reserve renal capacity. That this is an important fact, capable of being turned to diagnostic, prognostic and therapeutic usefulness, must be clearly evident.

In investigating the capacity of the kidneys in chronic interstitial nephritis under the ordinary conditions of life, and under those entailing extraordinary stress on all the organs engaged in the production and excretion of the urinary constituents, various procedures may be adopted, varying with the character of the information desired, and, it may well be added, with the predilections of the physician.

The conditions under which the excretion of urinary water may vary are so fully dealt with in the literature that only a few points of practical importance will be considered: As is well known the urine is, as a rule, notably increased in quantity, with a very considerable proportional and total reduction of the urea and other solids. Should the volume of urine decline, without a

corresponding reduction of liquid intake, further examination will disclose circulatory failure with occult or manifest edema. Much later, when there is added to the above high color and increased or even largely increased total urea excretion, cellular nutritive balance with destructive metamorphosis will be present. Observation will soon show that at neither the highest nor lowest output of urinary water does the excretion of urea and other solids reach the highest level; but rather is this found at some intermediate point, which, because of its therapeutic importance, should be, from time to time, closely determined.

During the recently passed years the excretion of chlorids has been very closely studied, and I have only a word to add in this connection, namely, that as a foundation for any dietetic directions which intelligently consider this question, there should be a fairly accurate determination of the chlorid excretory capacity of the kidneys. The methods may be readily adapted.

In the present state of our knowledge in chronic interstitial nephritis, and in connection with our theme, greatest interest lies in estimating, comparatively and absolutely, the excretory capacity of the kidneys for those nitrogenous substances resulting from proteid metabolism of which urea is the chief and best known.

For the purpose of obtaining information as to the renal capacity, I am in my own practice accustomed to employ the following procedures:

The daily urine is examined closely, and recorded and charted every day during the entire time occupied in making the observations, which is divided into a series of periods of three days each. During the first of these the patient is under his accustomed diet and regimen. During the second he takes two freshly made pills of mercurial mass every night, followed by a saline cathartic next morning. In the third the diet is restricted to water, cream and water soups and thin gruels, all in moderate or small quantities, with physical rest. During the fourth he has added to his diet breads, rice and potatoes, the food having a daily caloric value to meet fully nutritional requirements. To this there is added 300 gm. of lean meat during each of the three days of the fifth period; 400 gm. in those of the sixth; 500 gm. in those of the seventh; 600 gm. in those of the eighth. If desirable, the series with increasing amounts of proteid intake may be further extended if required.

In giving the meats in this gradually ascending scale, it will be noted that during the earlier periods the urea excretion rises directly as to the proteid ingestion. As the scale ascends, however, there comes a time in which ingestion of proteids and excretion of urea no longer run parallel, the latter lagging behind; later this becomes so marked that I prefer to terminate the investigation.

Applying the rule of averages, to which no chronic interstitial nephritic patient very closely conforms, the daily excretion of urea by the three-day periods may be tabulated as follows:

Period 1, under ordinary diet and regimen.....	12 gm.
Period 2, under ordinary diet, etc., with evacuants.....	8 gm.
Period 3, under very restricted diet and rest.....	6 gm.
Period 4, under full carbohydrate diet plus 300 gm. lean meat	14 gm.
Period 5, under full carbohydrate diet plus 400 gm. lean meat	22 gm.
Period 6, under full carbohydrate diet plus 500 gm. lean meat	30 gm.
Period 7, under full carbohydrate diet plus 600 gm. lean meat	36 gm.

If during the fourth and subsequent periods the patient subjects himself to unusual active and passive muscular exercise, the urea output should be considerably augmented. Should there be any material deviation in a downward direction, from the curve of urea output, based on the above, a corresponding renal incapacity is indicated; any excess above that of the first period which may be observed during periods of four to seven, inclusive, represents reserve renal capacity.

In making these tests, wide variation in methods, and in additions to or subtraction from the details of those mentioned, may be practiced, as required, or as individual experience demonstrates to be the most available. Special emphasis, however, should be laid on the character of the proteid given, inasmuch as the urea output after the ingestion of meat follows fairly promptly and reaches its full height on the second, certainly on the third, of these days, whereas should eggs be employed, a much longer time is required for elimination. There may be added during these last three days as much active and physical muscular exercise as the patient is able to bear, which will further increase the output of urea. Personally, I prefer to make this a fourth three-day period, but this is probably immaterial.

As an example of the wide variations met with in making these estimations, the following case is worthy of mention. A few years ago a gentleman, 65 years of age, with chronic interstitial nephritis of many years' duration, passed, under great urinary stress, urine which contained during one twenty-four-hour period 64.5 gm. of urea. In making several tests, such as those described, the urea with great uniformity rose to from 30 to 35 gm. per day, and if much exercise should have been taken during the final period 35 to 40 gm. were not uncommon.

In making these tests from time to time, other important features were noted. For example, it was noticed almost constantly that, following the test, the patient appeared to be very much improved over his former condition. Most of this improvement was of such a nature that it could not be definitely measured. The patient, however, appeared to be fully aware of the fact, and indefinitely I shared his opinion. For this reason I have made these observations with more or less frequency in each patient for the purpose of obtaining, first, diagnostic and prognostic information; second, for possible therapeutic advantages; and third, that the patient's interest in his case and its management may be intelligently and optimistically maintained.

It is a fair inference that, if known, the output of urea can by simple measures and with safety be so stimulated that from an average of 10 to 15 gm. per day, an amount double this may be uniformly reached; the anatomic alterations and physiologic capacity are such as to eliminate urea, chlorids, phosphates, sulphates, etc., with fair safety. The danger to these chronic interstitial nephritides must, then, lie in the failure of the kidneys to eliminate other toxic substances of a nature so subtle as so far to defy analysis. It is also probable that the circulatory, and especially the extravascular circulatory changes are responsible for the failure to eliminate these heretofore undefined toxic agents. From this it may be readily seen that such measurements as those described fall far short of our requirements. Nevertheless, they are, taken in connection with such other observations as those of estimating the blood-pressure, the retinal fields and a careful review of the symptomatology, the best obtainable at the present time. As the results of my own observations, I am of the opinion that those cases in which there can be demon-

strated, with regularity, a fair or large reserve renal capacity offer the best chances for prolonged life, physical and mental capacity and usefulness, while those in which the reserve renal capacity is but slight are in much greater risk of prematurely encountering the various serious accidents which accompany the later stages of this malady.

On the information obtained may be based some important details of management. In my own practice I advise such active and passive muscular exercises as may be taken without evidences of urea retention. Also the amount of proteid ingestion, always small or moderate, is gauged in like manner. These I consider points of great practical importance.

Along similar lines estimations may be made of the capacity of the kidneys to eliminate urinary water; also of chlorids. The latter, taken in connection with observations on the weight of the patient and of the extra-vascular serum accumulation, blood-pressure and cardiac hypertrophy, is of prime importance and should be made with regularity. It is not my purpose, however, in this paper to consider this line of thought; my main object is to stimulate further and more accurate investigation.

4744 Woodlawn Avenue.

ABSTRACT OF DISCUSSION

DR. FRANK BILLINGS, Chicago: What Dr. Wells has read to us this morning should be a lesson; what he has given us has been an individual study of a diseased organ, the kidney, and there is much that is new in it. The method he employs in estimating the functional capacity of the kidney is interesting; perhaps if one wished to offer a criticism one might say that one could not, by such measures as he employed, fully estimate the physiologic function of the kidney, or the metabolism of the body; yet clinically the measure he employs is the only one that is practical by which we can reach any such conclusions. The painstaking way he has worked with the different diets, day after day, and all before he has arrived at any conclusion, shows that his work and study is worthy of careful consideration. He is using the same methods we should use in other diseases, such as diabetes—measuring the individual capacity of the patient.

DR. WALTER L. BIERRING, Des Moines, Iowa: The thought arises whether the disturbances in the nutritive balance may not be influenced by other organs besides the liver. In considering the condition termed chronic nephritis, a very close relationship was recognized between that triad of structures, the myocardium, the blood-vessels and the kidneys. It is also exceedingly difficult to estimate the functional capacity of the kidney, to note only the urinary findings; and oftentimes many of the symptoms which are most indicative of chronic nephritis are those of retention phenomena. The prognosis in chronic nephritis is dependent largely on the condition of the myocardium, and it appears to me that possibly in our efforts to preserve this reserve force referred to in the paper, we really bring about a condition more favorable to the myocardium or myocardial function; whenever we bring about such a condition by means of proper diet or otherwise, it tends to lower arterial pressure, lessen the strain on the heart, the retention phenomena become less marked, and a better functional ability of the kidney is brought about.

DR. EDWARD F. WELLS, Chicago: My paper illustrates the futility of attempting to make a suitable presentation of an important subject in the short time allotted; therefore I limited my remarks mainly to a consideration of certain tests for measuring the reserve capacity in chronic interstitial nephritis, with a well-preserved circulatory balance. In a few words I mentioned the fact that under certain circumstances, especially with a failing circulatory balance and a consequent nutritional disturbance, the tests mentioned are inapplicable. It must be clearly apparent that the tests mentioned are crude, but, rudimentary as they are, the methods are those which I have found available and useful for testing the urinary

capacity of my patients. To these there should be added a study of the functional capacity of all the organs engaged in the preparation for urinary excretion. Those presented I should be pleased to have considered simply as a beginning of work along these lines, with the confident expectation that, intelligently practiced, they will be found as useful in the malady mentioned as are similar procedures in the study and management of diabetics. My object has been to extend our diagnostics—making a therapeutic and a prognostic diagnosis, if you will allow the terms; nevertheless, certain beneficial therapeutic results were obtained from the tests employed. However, I do not wish to lay any undue stress on this point.

TREATMENT OF DIABETES MELLITUS *

A. J. HODGSON, M.D.

WACKESHA, WIS.

It is impossible in a paper of this kind to consider more than the most important points in the treatment of diabetes mellitus. The various special treatments that have been recommended for this condition cannot be discussed. A bibliography will be appended, but no attempt will be made to give any extended references to the many excellent papers that have appeared on the subject. The object of this paper is to call attention to certain well-defined principles which must govern the treatment of this serious and stubborn disease, if any satisfactory outcome is to be hoped for.

While this paper deals only with the treatment of diabetes, it is necessary for purpose of clearness to refer briefly to the etiology of the disease. A small percentage of cases are caused by some severe pre-existing pathologic condition that removes them from consideration in a paper of this kind. Such cases are those due to carcinoma of the pancreas, to syphilis, etc.

The cases that will be considered in this paper and which make up approximately 90 per cent. of all those exhibited by the patients that present themselves, are due to what may be called errors of metabolism. To assign this as a cause, however, is not to explain, for there are causes operating behind these metabolic errors. A careful study of the habits of a large number of diabetics convinces me that one of the most fertile causes of diabetes mellitus is a long-continued toxemia or auto-intoxication due to gross errors in eating. There are, of course, other causes: oft-repeated emotional excitement, the excessive use of starches or of alcohol, arteriosclerosis, that undefinable something which, for want of a better name, we call the gouty diathesis; heredity, sometimes associated with exophthalmic goiter—all these seem to play a part in the etiology of this disease; but by far the most important cause is the one first given, errors in diet.

WHAT CONSTITUTES A CURE

It should be impressed on the patient that a "cure" of this disease is not possible in the sense in which he understands a "cure," viz., that after the glycosuria has been overcome he may go back to his old habits of diet. He should be told that after his apparent recovery, continued care in eating is essential to his continued health. As well might a consumptive in whom the tuberculous process has been arrested by careful treatment expect to go back to foul air, insufficient light and lack of nourishing food and remain well, as a diabetic to keep his urine sugar-free while violating the very dietetic rules the disregard of which brought on his trouble.

* Read in the Section on Practice of Medicine of the American Medical Association, at the Sixty-Second Annual Session, held at Los Angeles, June, 1911.

DIETETIC ERRORS A FREQUENT CAUSE

In the past twenty years I have treated somewhat over 1,100 diabetic patients. A careful study of these cases has impressed me with the fact that the great majority of patients who suffer with this disease do so because, through ignorance, they have grossly abused their systems with the quantity, quality and kind of food used. Too much food, bolting the food so as to preclude proper insalivation, reading, thinking deeply or worrying while eating, using uncooked or but partly cooked starches—all these are contributory causes to that deranged metabolism which exhibits itself as diabetes. Particular stress should be laid on the viciousness of the prevalent habit of using large quantities of carbohydrate foods in which the starches are practically in an uncooked state, baking-powder biscuits, batter cakes, corn-bread, waffles, various forms of crackers—especially the Graham cracker, so largely eaten under the mistaken idea that it has an extraordinary food value—all these forms of starchy food are bad and contribute in no small degree to recruit the increasing army of diabetes. These causes will be taken up in greater detail as the treatment of the disease is considered.

The value of any treatment for any disease must be judged by results. And the results must have been obtained not in a few isolated cases but in a long series of cases. In order to make clear whether the treatment about to be described is worthy of consideration a table is appended of the cases of all the patients treated from May 1 to Dec. 1, 1910, giving the age of the patient, the duration and severity of the disease and the result of the treatment.

This table, of course, is but the briefest of outlines and is intended only to emphasize the results of the treatment. While more or less complete histories of more than 1,100 cases could be given, such a tabulation would be out of place in a paper of this kind. Before closing, a typical case-history will be given in detail with the treatment.

OBJECTIVE POINTS IN TREATMENT

In treating the class of diabetics with which this paper deals there are four objects to be kept in view:

1. To free as nearly as possible the blood and other tissues from sugar; to do this it is necessary—
2. To find the individual patient's tolerance for carbohydrate and if possible to increase that tolerance;
3. To find a diet that will furnish the necessary calories without, at the same time, increasing the sugar intake; and
4. To prevent, by dietetic or other measures, the constipation with which the majority of these patients suffer and which increases the toxemic condition.

The first thing to impress on the patient is the fact that this disease—in the class of cases under consideration—is one that possibly has been years in developing and that it is useless and hopeless for him to expect to obtain any relief in a short time. The changes which a long-outraged system has undergone are such as cannot be remedied in a week or a month. In diabetes, more than in almost any other disease (unless it is tuberculosis), the help and cooperation of the patient is absolutely essential to successful treatment.

FUTILITY OF DRUGS

Another fact to be emphasized is the futility of drugs in the treatment of this disease; futile, because harmful habits cannot be cured by drugs. A large percentage of the patients who present themselves bring with them