Relation of the diseases of the kidney, especially the Bright's diseases, to diseases of the heart : the Middleton Goldsmith lecture, delivered before the New York Pathological Society, April 18, 1888 / by J.M. Da Costa.

Relation of the Diseases of the Kidney, especially the Bright's Diseases, to Diseases of the Heart.

The Middleton Goldsmith Lecture.

Delivered before the
New York Pathological Society,
April 18, 1888.

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When, by your kind thought, I was asked to deliver the Middleton Goldsmith lecture before your learned body, several subjects occurred to me which, from their great pathological interest, seemed worthy of the occasion, and which I believe the generous founder of these lectures would have approved of, could his cheery presence be here to animate us. From among these I choose, partly because it has been with me one alike of pathological and clinical investigation, the relation of diseases of the kidney, especially the Bright's diseases, to diseases of the heart. Much has been done of late years to examine this subject; but it is far from being clear or complete, and I must claim your indulgence if, in the endeavor to add a little to our knowledge of it, I allude to some facts which to you must be trite.

We all know that there is a close connection between diseases of the kidneys and diseases of the heart. But how intimate is this connection, and what determines it? Is there anything in an affection of the heart which would lead to a kidney affection? Or

is the kidney disorder the starting-point of the undoubted combination observed? Again, are the lesions, when found together, both due to a common cause which determines them, and not the direct consequence of each other?

Allow me to detain you with a brief discussion of these weighty questions, before I call your attention to some of the finer points of pathological research which I shall attempt to demonstrate to you.

One of the first questions to solve is, Whether disease of the heart in itself leads to disease of the kidneys? The general impression is that it often, indeed generally, does. But on analyzing a large number of cases I find that this belief is incorrect. I will here give some of the results of my investigations into the matter, and will take the records of the Pennsylvania Hospital for a period of ten years, extending from the beginning of 1877 to the beginning of 1887, and similar records from the Clinical Department of the Jefferson Medical College for a period from June, 1875, to January 1, 1888, selecting merely the cases of which it was reasonably certain that the cardiac affection was the primary lesion.

At the Pennsylvania Hospital were noted of such cases of *valvular heart affections*, 76; at the Jefferson Medical College Clinic, of valvular heart affections, 51. Of these 127 cases, in all of which the urine was examined, for the most part repeatedly and at different times, and in many of which, especially in the cases at the Pennsylvania Hospital, autopsies are recorded, there were in 92, it is specifically stated, no evidence of any kidney disorder, as shown by the absence of casts, of albumen, and, in a number of instances, by the notes of the post-mortem changes. The 76 valvular

heart cases at the Pennsylvania Hospital furnished 28 cases in which some concurrent kidney affection was observed ; the 51 cases at the Jefferson Medical College Clinic showed but 7. Of these 7, in one (Case III. of series), happening in a child with a mitral regurgitation, there had been scarlet fever three years, and an attack of rheumatism two years prior to the record of the case ; there was hypertrophy with dilatation in connection with the valvular disease, and chronic parenchymatous nephritis. In another case (Case XIII.), that of a man fifty-two years of age, the mitral lesion, following rheumatism, was associated with urine one-fourth albuminous and of character usual in parenchymatous nephritis. The dropsy began in the abdomen, the swelling there preceding that of the feet and legs for nearly a year. In the third case (Case XXV.), a presystolic mitral murmur was found with hypertrophy of moderate degree, but with considerable dilatation. The heart's action was irregular, the urine was full of albumen, and attacks of cardiac asthma and occasional uræmic convulsions occurred. In the fourth case (Case XX.), a married woman, twenty years of age, there was some abdominal dropsy and a puffy face. The valvular lesion consisted in aortic regurgitation with a slight mitral regurgitation ; considerable hypertrophy of the heart existed. The pulse was 128. The urine was free from sugar, of specific gravity 1.018, and contained small amounts of albumen. The kidney was considered to be in a state of parenchymatous inflammation.

Of these four cases, in all of which, probably, the kidneys were in a state of chronic parenchymatous nephritis, the first ought really to be excluded, since the kidney affection much more likely had its origin

in scarlet fever, leaving thus only three undoubted cases.

In three more of the series albumen is mentioned as occurring in very small quantities. In one (Case XVI.), it was present with tube-casts; in another (Case XXXI.), where a mitral presystolic murmur as well as an adherent pericardium existed, a few hyaline tube-casts were discerned in a feebly acid urine, free from bile and sugar, but containing a small amount of albumen and crystals of oxalate of lime. In a third, in which mitral regurgitation with considerable hypertrophy and dilatation was noted, albumen in small and varying amounts was detected, but nothing else. In all three instances it was due to congestion of the kidneys, and was not evidence of Bright's disease. We have then but 3 cases in 51 in which a kidney affection really existed.

I will now examine the 28 cases out of the 76 recorded at the Pennsylvania Hospital, in which the urine examinations indicated co-existing disorder of the kidneys. In 16 of the 28 the record speaks specifically of but small amounts or of traces of albumen, and of the absence of casts. In one of these (Case I.), the autopsy tells of kidneys showing no marked alteration of structure except that, weighing respectively six and seven ounces, the capsules were thickened, and the right kidney contained two small cysts. The highest amount of albumen recorded in these 16 cases is one-sixth of the test-tube, sometimes one-tenth, and often the merest trace.

In 6 cases (Cases II., XVI., LV., LXIII., LXIX., LXXVI.), tube-casts are described in addition to the albumen. They were hyaline or slightly granular casts. In two of these six cases we have autopsies,

and this is a summary of the record. In one (Case LXIII.), the hypertrophied heart weighed thirty-six ounces, there was marked insufficiency from contraction of the aortic leaflets, slight thickening of the mitral; the kidneys were congested, cyanotic, otherwise normal. In the other (Case LXIX.), the heart weighed fifteen ounces, the mitral and aortic valves were both thickened. The kidneys were congested, but not altered in structure.

In 6 cases the clinical record is that of much more serious disease. But one of these (Case LXV.) we must at once exclude, as the albumen, the pus, the epithelium, which existed in connection with the mitral disease were clearly of vesical origin, and any renal implication was most doubtful. Five cases of marked renal affection, with highly albuminous urine, we still have to account for. Of these, in one (Case LXI.), there were also pus-cells and bladder epithelium; but distinct renal casts were detected, and the case was looked upon as one of parenchymatous nephritis complicating mitral insufficiency. In two (Cases XLII. and LIV.), the same view was taken of the renal complications, associated in Case XLII. with mitral narrowing; in Case LIV. with both mitral and aortic insufficiency. Yet in this case, in which highly granular and hyaline casts abounded, and in which the albumen was in bulk two-thirds of the test-tube, the conclusion is vitiated by the patient having been a great drunkard, and all his tissues having been profoundly altered. Case XLVII. is very instructive on account of its clear history. It happened in a man who had rheumatism thirteen years prior to admission into the hospital, but in whom dropsy and puffiness of the face only appeared two months before. The urine

contained albumen, granules and fatty casts. The greatly enlarged heart weighed, with clots, thirty-six ounces, without clots, thirty-two ounces. The mitral orifice readily admitted four fingers; so did the tricuspid orifice; the aorta was fully twice as thick as normal, but the aortic valves were competent. The walls of the right auricle were double the natural thickness; the left ventricle, its cavity enlarged about one-half, had walls measuring near the base one inch. The kidneys were engorged and appeared in the early stages of parenchymatous nephritis. The left kidney, weighing twenty-four ounces, contained a few cysts on the surface; its blood-vessels were prominent, but not thickened. The right kidney was about the same in size and structure.

In Case LXX. we also have an autopsy. The aortic and mitral leaflets were thickened and contracted. The kidneys were large, firm, harder than normal and evidently diseased, but showed no adherent capsules or signs of contraction.

Summing up the whole inquiry, we find in 127 cases of valvular disease of the heart but 8 in which any true affection of the kidney existed—anything more than mere congestion. And among these eight there is not one instance of the contracted or cirrhotic kidney. In truth, the kidney disorder that results from a valvular disease of the heart is simply a congested kidney of full size, redder, a little more glistening, and in elderly people, or where the congestion has been of long standing, firmer than normal, showing even slight increase of fibroid texture, and, perhaps, a rather more adherent capsule. Persistent engorgement of the renal veins gives the well-known livid, cyanotic appearance to the somewhat indurated

organ. The epithelium of the tubes is swollen, and finally undergoes granular degeneration.

I have, by the analysis of the cases, endeavored to give you a proof how rarely valvular disease of the heart leads to chronic disease of the kidneys, other than congestion. When it does, the form of affection is that of a chronic congestion, which, in its turn, passes into a parenchymatous nephritis. The granular contracted kidney does not, I believe, result from the process of congestion just alluded to; though, as I have already said, occasionally, especially in elderly people, the kidneys from long-standing congestion may appear hard and exhibit a slight amount of fibroid change. These statements seem at variance with those of one of the most eminent of your members, Dr. Delafield,[1] who, in 137 cases of death from heart disease, reports 27 large white kidneys, 29 atrophied kidneys, and 28 of chronic nephritis which could not be classed as either large white or atrophied organs. Perhaps the apparent discrepancy is to be explained by the cases being heart disease of which it was not specifically known whether it preceded the renal affection or followed it.

During life it may be very difficult in individual cases to determine whether we have, as the result of the heart malady, simply a congestive condition of the kidneys or real Bright's disease; in truth, as in both states dropsy is a prominent symptom, we obtain but little aid from the general symptoms, having to base our opinion largely on an accurate cardiac investigation. It may be thought that the urine would afford us much assistance; but this it does not always do.

1 "System of Medicine by American Authors," vol. iv.

A good many of my observations in purely cardiac cases speak of urine of low specific gravity, scanty, containing traces of albumen, and here and there casts. The character of these casts is, for the most part, epithelial and not highly granular ; though this, too, must not be taken as an absolute rule. On the whole, the most important diagnostic sign, with reference to the urine, is found in the slight and varying amounts of albumen and in the infrequency of the casts. Moreover, though it has been stated that the urine in even these heart cases with renal complication, which is not Bright's disease, may have a low specific gravity—in one of my cases it was only 1.006—as a rule, the specific gravity of the scanty urine is high, ranging from 1.020 to 1.024 ; in one instance of mitral disease my record speaks of 1.030. Sugar was examined for, but found only once (Case XXII. of the Jefferson Medical College series) ; here there was aortic regurgitation. Urates, my notes say, are often abundant, biliary coloring matter is not infrequent.

The character of the pulse, the absence of marked arterial tension, and the precise physical signs of the cardiac disease, give us, taken as a whole, more valuable diagnostic evidence than the state of the urine. We may also lay stress on the want of uræmic symptoms, and avail ourselves of the ophthalmoscope as a means of diagnosis. It has, in fact, happened to me several times to determine, by finding albuminuric retinitis, the true meaning of the renal change and the secondary nature of the valvular affection. In one of these instances, indeed, albumen was at several examinations absent, tube casts were but few, the specific gravity was, as a rule, low ; but the whole progress of

the case, the uræmic symptoms which arose, the absence of dropsy, showed, irrespective of the eye appearances, that the renal malady was the preponderating and original affection.

Before proceeding, it may not be without interest to point out that the most common form of valvular disease, associated with renal disorder of the kinds we have found to exist, is mitral narrowing. In 8 of the cases at the Pennsylvania Hospital it is noted only in 2 that the urine is free from albumen. In the cases in which a real structural affection, a parenchymatous nephritis, is developed, mitral stenosis has a preponderating influence. Next stands—for tricuspid disease is so rare that I have not data sufficient to judge by—mitral regurgitation. In uncomplicated aortic disease albumen and casts are very seldom detected in the urine, so seldom that it is always a question whether a mitral complication is present when kidney engorgement is found.

Pure *hypertrophy* and pure *dilatation*, instances, therefore, of enlargement without valve affection, give us the same form of kidney derangement we have been studying. But with reference to hypertrophy, unless the cavities are at the same time decidedly stretched we do not find albuminous urine. Thus this existed in only 1 out of 10 cases noted at the Jefferson Clinic. In pure dilatation, urine with traces of albumen, indicative of congestion of the kidney, is more common. Still, it does not exist in the majority of cases; and I have known it not to appear until the last week of life, even though that life had been a burden for months, owing to the enormous dropsical swelling and the turgid lungs.

We have been studying diseases of the heart and the kind of kidney affections they induce, selecting for analysis cases where, from the history, or from the post-mortem results, or from both, the record of the antecedent malady was clear. We now turn to diseases of the kidney and their combination with diseases of the heart. It is well known that this combination is a frequent one. We find diseases of the kidney associated with valvular disease of the heart; with hypertrophy; with dilatation; and with pericardial affections. In studying the subject I mean to draw conclusions only from instances in which from the history, as well as from the concomitant features of the case, we may fairly judge that the kidneys were the first, or at least simultaneously diseased.

Let us examine the *valvular diseases of the heart* as they are found associated with affections of the kidney. I find, looking at the records of the Pennsylvania Hospital for ten years, from the beginning of 1877 to the beginning of 1887, that in 101 cases of renal disease, in which the state of the heart is particularly mentioned, 41 cases have a concurrent valvular heart affection, and in 60 there is no such lesion. Of the total 101 cases, 57 are acute Bright's disease, and 44 chronic. Of the 41 renal cases with valvular lesion of the heart, 29 are Bright's cases of the chronic type and 12 are of the acute type. Of the 29 cases of chronic Bright's disease, with the associated valvular heart lesion, it is noticed that 13 have a preceding history of rheumatism. In 5 there is a positive statement of no preceding rheumatic history. In the other 11 cases, nothing is remarked about rheumatism.

Of the 12 acute cases with concurrent valvular lesion, 3 cases have the record that rheumatism did

not precede. In the other 9 cases nothing is said with reference to a rheumatic history.

Out of 29 cases of chronic Bright's disease with valvular disease, the age of the youngest was thirty-three years; 14 of the 29 were beyond the age of forty-five years; the oldest was sixty-five years of age.

Of the 44 chronic renal cases, 8 were examples of the large white kidney. The ages of these 8 were from forty-eight to sixty years. 1 case had double mitral and aortic murmurs, and was preceded by several attacks of acute rheumatism. Of the other 7 nothing is stated about either the heart or a rheumatic history.

Of the 57 acute renal cases, in none are mentioned signs of cardiac hypertrophy without a valvular affection; nor, indeed, do the notes show that even with this complication was the heart enlarged.

In the notes of the Clinic of the Jefferson Medical College, in 21 acute cases of Bright's disease, 20 of which had marked dropsical symptoms, the heart was found to be normal in all but 4, two of which had had a previous history of acute rheumatism. In these 4 cases there were evidences of valvular disease without hypertrophy.

From an analysis of these observations it becomes evident that the character of the kidney affection, in combination with the valvular lesion in the heart, is, in the vast majority of instances, the contracted kidney. Next stands acute Bright's disease, where also we find valvular affections; but here without the hypertrophy so common in the first group. In the acute, the strong influence rheumatism exerts is very clear. Nor is that influence lost in the chronic, where an unusually large proportion are associated

with rheumatism ; too large a proportion for us to assume that it is a mere coincidence.

Let us inquire what the state of the valve lesion is. It is chiefly an affection of the mitral valve, consisting in a thickening of the mitral, with here and there rough deposits. Next in frequency, but with similar pathological changes, we observe a lesion of the aortic valves, occasioning either aortic narrowing or aortic regurgitation. A further cause of the valve affection is seen in some of these cases to be due, I believe, to the hypertrophy of the heart associated with the Bright's disease preceding some general thickening of the valve, though even this may be wanting. A stretching of the valve subsequently takes place, yet insufficient to close the orifice in the enlarging heart. Thus the hypertrophy and the dilated condition of the cavities give rise to the valvular imperfection. It is in this way that I explain some very striking and interesting cases of hypertrophy occurring in advance of the valvular lesion, which I have observed, and in which the autopsies showed simply this imperfect closure of the orifice with a slightly thickened mitral valve, and at times with shortened and more rigid papillary muscles.

I have known, but far less often, a similar state at the aortic orifice. The aortic disease that existed was due to the stretching of the valve, which, having reached a certain point, could go no further. This stretching, with a simultaneous thickening, produced an opening through which the blood flowed back. It is thus that we may have a valvular disease following hypertrophy with dilatation, rather as the result of this process, than the hypertrophy and dilatation the result of it. If you ask me whether this is a common cause

of valvular lesion in Bright's disease, I say it is distinctly not; it is very much less common than marked valvular thickening with degenerative change.

You see, then, that the valvular disease of the heart which occurs in diseases of the kidney, may be of varying origin; chronic thickening, deposits, degenerative changes, co-existing rheumatic alterations which have led to these changes, and, lastly, mere hypertrophy and dilatation, which, associated, perhaps, with slight valve thickening, or with rigid papillary muscles, in its turn leads to valvular imperfection. Omitting the last-named group, the ordinary valvular affections in the Bright's diseases are the results of the altered tissue nutrition of the valves and the degenerative changes which take place there, as they take place in both the large and small vessels of the body. They are favored to a greater or less degree by the morbid products, which, from want of proper elimination on the part of the kidneys, circulate in the blood. It may also be a question whether, in part at least, the altered nutrition of the valves may not be due to affection of their nervous supply. The changes, the degenerative ones certainly, are favored by age. Yet we cannot assume that age is the important factor it appears at first sight; for the acute Bright's affections show also, as has been proved, a strong tendency to the implication of the valvular apparatus, and the acute affections are much more common in the young, or at least, in younger people, than are the chronic affections. Let me further notice, once more, a point brought out in the analysis of the cases submitted to you, namely, the frequent existence of rheumatism. This may well produce the valve injuries at the same time that it leads to other lesions in the body; and

thus be a general cause, alike for the valvular affection and for the disease of the kidney and of other textures.

Before ceasing to examine this aspect of the subject, I will call your attention to some purely clinical facts which must make us receive with caution many of the statements of co-existing valvular disease of the heart and of Bright's disease. It is often recorded that there was present a soft murmur, variously heard; in some instances at the apex, in others at the right base. Now these murmurs in Bright's disease are not the result of valvular affection. They come from the state of the blood; or they are simply murmurs from temporary perversion of valve action, what we may call functional murmurs. They are inconstant, they are soft, they are very much influenced by the act of breathing. and they are not signs of valvular disease of the heart. You will easily see that the error is all the more readily committed because we have hypertrophy, with or without dilatation, as such a common attendant upon Bright's malady. Thus, the mere hearing of a murmur in the heart is not a sign of valve affection in Bright's disease, not even when there is co-existing hypertrophy. We have to take into account its persistence, its character, generally rough, the state of the second sound of the heart, and the fact that it may be heard in the axilla, and posteriorly near the angle of the scapula, to make clear that it is of organic type, and not of the temporary character just referred to. Bearing this in mind, we shall have to reject a great many of the cases of so-called valvular disease of the heart, often loosely reported, in which the only evidence of the valvular affection is based upon a murmur, the particular character of which is not

stated; or its softness or temporary nature is alluded to, but an erroneous conclusion is drawn from its existence.

The difficulty does not exist with reference to diastolic murmurs, which, in my experience are always organic. But it is not lessened by a study of the pulse, which is in itself altered by the arterial lesions of the Bright's malady and by the thickened left ventricle; nor can we place, for similar reasons, much dependence on sphygmographic tracings.

I think, then, that the number of cases of valvular disease of the heart, existing as a complication of Bright's disease, is more often over-stated than understated. Indeed, with the greatest care, unless the case have been for a long time under observation, it may be almost impossible to detect the true relation between the maladies. Much of the difficulty will be, however, solved, if we accustom ourselves to look upon them as not dependent upon each other, but due to a common cause, working almost simultaneously, or even at different periods, mischief in kidney, heart, and other textures. To the frequent starting of this common cause in rheumatism, attention has been called.

Let us pass to an examination of the *hypertrophy of the heart* which exists in combination with Bright's disease of the kidneys; I mean where the hypertrophy, with or without some dilatation, is a pure process, and not complicated with valvular disease. With reference to the acute cases of Bright's disease, I have already mentioned that we do not find hypertrophy. In the 22 cases of this character at the Jefferson Clinic, and in the 57 cases at the Pennsylvania Hospital, therefore in 79 cases, in most of which there was marked dropsy, in not one were the signs those of

hypertrophy, not even in the instances with valvular lesion. A few doubtful exceptions are observed in the notes where strength of impulse is mentioned; but in these it is probable that the valvular affection which co-existed had its origin in a previous attack of rheumatism.

We may then assume as positive that hypertrophy of the heart does not occur in acute Bright's disease. This is vastly different in the chronic form of the malady. Here, as is well known, hypertrophy is the rule. This subject is a matter of such common observation that it scarcely needs reinforcement by figures; but I will quote, since they are based solely upon post-mortem records on a most extensive scale, the recent researches of Goodhart in *Guy's Hospital Reports* for 1886.

In the ten years from 1873 to 1882 inclusive, there were autopsies of 344 cases of granular kidney, and of 196 of chronic parenchymatous nephritis. The weight of the heart in the cases in which the kidneys were described as granular, was in only 103 under twelve ounces, which was, therefore, within the limits of average weight. In 226 it was above this weight. Making allowance for all possible exceptions, as old age and wasting disease, and adding 36 which were hypertrophied hearts, though of average weight, there are 262 cases of marked hypertrophy in 329 undoubtedly granular kidneys,

After making all deductions for the cases of chronic parenchymatous nephritis, there were in 25 only a heart of average weight; in 119 there was hypertrophy of the left ventricle, a proportion of over 1 to 4. In lardaceous disease of the kidney, hypertrophic changes in the heart and arteries were not observed,

which agrees well with the general observation on the subject.

Dilatation of the heart becomes associated in a more or less marked degree with the growing muscle. It affects pre-eminently the left side of the heart. In Goodhart's paper, just quoted, I find 51 cases of notable dilatation of the left ventricle associated with hypertrophy in the 344 cases of granular kidney, and 33 cases in the 196 cases of chronic parenchymatous nephritis. It would therefore appear that the dilatation predominates in chronic parenchymatous nephritis; while pure hypertrophy does so in granular kidney.

In cases of hypertrophy, such as I have described, the heart attains very great size; the muscles are firm; for the most part it is a pure hypertrophy, only here and there takes place some increase of the fibrous as well as of the muscular texture. The muscular fibres are a little more opaque, and sometimes more granular than normal. As the affection advances, secondary degeneration, granular and fatty, may occur; but they do not happen unless there be decided co-existing disease of the vessels.

The state of the arteries in these instances of hypertrophy is very interesting to note. They show the same condition which has been found in the kidneys, in the brain, in the spinal marrow, in the lungs, and in many other parts of the body. The inner coat is thickened, the muscular coat hypertrophied, the outer coat in a state of fibroid change, and the whole lumen of the vessel greatly lessened by these encroaching lesions. This lessening of the calibre is the same, as are the changes the same, that we find in the renal vessels, and it may take place to a very great degree. My colleague at the Pennsylvania Hospital, Dr. Arthur

V. Meigs, has recently shown me a section of a heart obtained from a man under his care who died of granular kidney, with aortic valve disease, and left ventricle from three-fourths of an inch to an inch thick, which exhibited besides increased muscle beginning interstitial change. Microscopically examined, the first ascending branch of the left coronary artery was so much thickened, chiefly by the increase of the intima, that the lumen of the vessel was a mere chink, the thickening being irregular, about four times more on one side than the other.

You will readily see how such a state of things might lead to secondary degeneration by cutting off the blood supply from the hypertrophied muscle; and it is most likely that the degenerations in the hypertrophied hearts of Bright's disease, which, however, I believe are not the rule, come on as an after-result of the altered vascular supply.

As a few minutes ago I called your attention to some points of diagnosis with reference to valvular disease in Bright's affection, I may now call your attention to some points with reference to hypertrophy. It is not always easy to make this out clinically. We have to consider not only the size of the percussion dulness, but the extent of the impulse as well as its force and position; the lower apex beat, which is often felt on a line with or beyond the nipple; and the heavy character of the first sound. Nor must we fail to take into account the character of the second sound, its accentuation at the base, which commonly happens in these hypertrophies in connection with renal change. Strong, extended impulse, displaced apex, altered sounds, and increased percussion dulness are the phenomena by which we judge; but not by any one of

these alone, certainly not by the impulse, which may be temporarily increased by other causes than cardiac hypertrophy. On the whole, I lay most stress on the altered character of the sounds of the heart, both at the apex and the base, and on the changed position of the impulse.

The enlargement of the heart which takes place in Bright's disease of the kidney may be made use of in prognosis. We are often greatly at a loss to form an opinion as to the probable length of the case and to the way in which it is progressing. Up to a certain point, the occurrence of dropsy and of eye changes will assist us, as well as the evidences of marked arterial tension. But dropsy, while common in chronic parenchymatous nephritis, is very generally absent, or but slight in cirrhotic kidney. The urinary examination does not always afford us much light, for some of the worst cases are those in which—I allude especially to the cirrhotic kidney—the amount of albumen is small, or often temporarily absent, and in which the tube-casts are few ; nor can we lay too much stress on the character of these casts. It is under these circumstances that I think the heart condition becomes an especially valuable means of prognosis. Where the heart is but slightly affected, there will be reason to believe that the case will continue for some time, provided we do not observe signs of uræmic poisoning. Where, on the other hand, the hypertrophy is marked, there is ground for the fear that the disease is more general, is advancing, and that the case will not belong to those long cases of the affection which we sometimes encounter. Thus the study of the heart may be made use of as a means of estimating the amount of general disorder and the likelihood of shorter or longer life.

Let me reiterate the view that, according to my experience, the hypertrophy in the majority of instances is a pure hypertrophy, unconnected with degenerative changes. It is certainly so in the earlier stages of the affection. In instances of long-standing disease and in elderly people, these degenerative changes may be found in the progress of the case ; but my observations do not at all agree with those of Buhl, who has stated that fibrous and chronic interstitial myocarditis is very frequently encountered in connection with the hypertrophy. To its occasional occurrence I have already alluded.

Dilatation of the heart unconnected with hypertrophy, or at least predominating over the increase of the muscular walls, is extremely rare. When it happens, it is the latter kind, namely, beginning as hypertrophy, but the rate of increase of the muscular structure not remaining in proportion to the dilatation of the cavities, that is met with. Among the cases at the Jefferson Clinic, I have collected some instances of what might be fairly called dilatation unaccompanied by hypertrophy, or attended only by a slight degree of hypertrophy ; and I have seen a small number in private practice. Goodhart points out that in the young the risk of dilatation of the heart is much greater than in older persons.

Another lesion of the heart which we observe in connection with Bright's disease, both acute and chronic, is *pericarditis*. But inflammation of the outer membrane of the heart forms only part of that general tendency to serous inflammation which we find in Bright's disease. It is probably due to the contaminated state of the blood, and neither its occurrence nor its explanation need here detain us.

Of all the heart affections passed in review, hypertrophy is the most common. Let us look at its cause. I leave out of consideration those cases where clearly existing valvular disease may have led to the hypertrophy; though even here it is always questionable whether some of the increased growth be not due to other causes than the valvular affection, and may not have preceded it. I will take the pure instances of hypertrophy and ask, How are we to explain them? It will serve our purpose best, if, in considering this much mooted and most intricate subject, we give a short summary of the different views held as to the cause of the hypertrophy, rather than attempt an historical review of how and by whom these views have been brought forward.

One of the main views entertained is, that the hypertrophy of the heart is due to the blood contaminated by renal excrementitious matter, exerting a stimulating effect upon the action of the heart, thus leading to hypertrophy of the ventricle; and, further, that the impure blood requires greater force of ventricular contraction to propel it through the unwilling vessels. This view has the great authority of Bright, and is to this day advocated by some eminent teachers.

A second view, while taking note of the influence of the impure blood, holds that the altered blood tension produced by the disease of the kidney, and the difficulty of the blood circulating through it, give rise not only to the well-known feature of heightened arterial tension, but to increased size of the heart to overcome the resistance of the renal organs. This is largely the view of Traube and some of the German investigators, and has been recently reaffirmed by Cornil.[1]

[1] Compte-Rendu du Congres International, tome i., Copenhagen, 1886.

A third view is, that the left ventricle beats with augmented force because the arterioles refuse to receive the altered blood, and in consequence of the resistance these vessels hypertrophy, especially in the arterial coat. To overcome this muscular resistance, the heart has to act with greater force, and its muscles increase. This is, in the main, the view of George Johnson, and is largely based on that change in the muscular coat of the arteries which he has so well described.

A fourth view is, that a fibroid degeneration, a fibroid overgrowth of the outer coats of the arteries, takes place over a large portion of the vascular system. In consequence of this, the heart has to struggle to overcome the resistence of the permanently narrowed vessels, narrowed by these hyaline, fibroid changes; and the enhanced blood-pressure shows not only in the raised arterial tension, but the increased resistance leads also to cardiac hypertrophy. This is mainly the view of arterio-capillary changes, of a vascular fibrosis as the cause of hypertrophy of the heart, which has been strongly and ably advocated by Gull and Sutton.

The last two views have much in common, at least as regards the production of the hypertrophy in consequence of the altered condition of the vessels.

I will mention a fifth view, which for the present I shall merely indicate, namely, that the hypertrophy, as well as to a great extent the vascular changes, are the result of a common process which takes its origin in the ganglionic nervous system. This is the view which in its main features flows out of some researches made by Dr. Longstreth and myself, and which here I simply state, intending presently to call your attention to the particular facts bearing on it.

Now, analyzing these different views, let us first take notice of the assumed influence of impure blood; and it is for practical purposes possible at the same time to examine into the supposed alteration of the blood-pressure due to the resisting kidneys. These views, which I thus group together, seem to me untenable. If true, why should we not have hypertrophy of the heart, and especially the form of hypertrophy far the most common, of the left ventricle, in other diseases of the kidneys than Bright's disease? Why should not, too, in the acute form of this malady, the heart be increased? It might be objected to this argument that, in the acute affection, the disease does not last long enough to produce muscular increase; but the objection will not hold good with reference to the other diseases of the kidney, in which serious, we might even say destructive kidney lesions take place, in which uræmic symptoms happen, yet in which there is no cardiac hypertrophy. I will take the instances, a number of which have come under my observation, of persons dying from extensive cystic degeneration of the kidneys, in whom the heart was found absolutely normal.

Here is one. In a gentleman, whom I attended, with a very large tumor in the abdomen, and who passed bloody and albuminous urine, there were for three weeks before death most marked uræmic symptoms. At the autopsy both kidneys were enormously enlarged, measured each about fourteen inches in length, were filled with cysts, and no trace of renal structure could be detected. It was, indeed, difficult to understand how life could have lasted so long with such extreme disorganization; yet the heart was quite healthy.

In a second case, the kidneys measured six inches in length, nearly four in width, and three and a half in thickness. The tissue was almost wholly converted into cysts, from the size of an egg to that of a pin's head. There was no disease of the heart. This specimen is now in the Museum of the Pennsylvania Hospital.

In a third case, the two kidneys were greatly enlarged, irregular in outline, the capsule was roughened by shreds of inflammatory adhesions; the organs, measuring each about seven inches in length and four in width, were filled with cysts. The thoracic viscera were in an absolutely normal condition. The liver was found to be highly fatty. The kidneys are also in the Museum of the Pennsylvania Hospital.

I shall cite two more cases, partly to sustain my view, and partly on account of the evident uræmia which preceded death. A man, under forty years of age, by profession a gambler, was admitted into the Pennsylvania Hospital in a comatose condition. He had been struck at by a companion, while drinking in a saloon, but was not hit. Immediately afterward, to the astonishment of those around him, he fell to the ground unconscious, and remained in this condition until death, a day or two later. No history of his previous state of health was obtainable, further than that he had seemed well, and was nightly occupied at his business as a dealer in gambling games. The urine was found to contain some albumen, and a large amount of sediment, mostly of a cellular character. Death occurred in the hospital with all the signs of marked uræmia. The urinary secretion was extremely scanty, and the unconsciousness profound.

The circumstances connected with the death led to the arrest of the companion who aimed the blow;

but the investigation of the Coroner showed that death was due to natural causes, and not to violence. At the autopsy the kidneys were found to be in an advanced state of cystic degeneration. They were greatly enlarged in all directions, and the tissue was almost entirely converted into cysts. The disease had evidently been of long duration. The lungs were normal, so was the heart.

Yet another case. A young servant woman, who had been in good health so far as known, fell on the floor while engaged at the wash-tub, and was found lying in an unconscious condition. She partly regained consciousness, but on her admission into the hospital, could give no satisfactory history. She died a few days later in a comatose state, with every evidence of uræmia. The kidneys showed advanced cystic degeneration. The heart was normal, and no lesions were presented in the other organs, save congestion of the lungs.

I have thus presented to you five cases leading to death, with the most advanced cystic degeneration of the kidneys existing, with the blood evidently impure, and finally occasioning, in the majority, marked uræmic symptoms, yet with actually normal condition of the heart.

I might go further in this line of argument, and call your attention to the enormous kidneys with calculi imbedded in them, kidneys which produce abdominal tumors large enough to be mistaken for gastric and omental cancers, also leading to death, and in which no disease of the heart was found: so, too, in instances of cancer of the organ; though, in this condition certainly, and even in cystic degeneration at times, the argument is somewhat vitiated by the fact

that, while one kidney undergoes extreme change and disorganization, the other may remain normal, or, at least, be still capable of performing its function fairly well.

The next views, those of arterial changes, whether in the muscular coat producing muscular hypertrophy, or from fibroid growth in the outer coats, I shall not discuss, further than to say that I believe the anatomical researches on which they are founded to be correct, having often seen the conditions referred to. Nor is it necessary to go into the question which is the most common of these changes, for I think that both may be found in different cases, and even in the same case at different stages. While thus concurring in the correctness of these observations, I will point out how insufficient they are to interpret the cardiac hypertrophy; how impossible it is to prove that blood is resisted by the altered vessels on account of its character; how difficult it is to explain the enlarged heart simply as the result of vascular changes, when we have striking alterations in the vessels, both large and small, in old age, and from syphilis, and in and beyond aneurisms, where we do not find cardiac hypertrophy happening as rapidly, or to anything like the extent that it does in Bright's disease, if, indeed, it happen at all.

Let me now, before taking up the fifth view, which I told you had grown out of observations by Dr. Longstreth and myself on the nervous ganglia, call your attention briefly to these observations, and supplement them by some which have not hitherto been published. Let me add, and here acknowledge, that in the researches about to be brought forward, which were most difficult and laborious to carry out, it is to the care and attention

of Dr. Longstreth that they owe their merit, rather than to anything I have myself been able to do. Let me also recall that in the investigations we made on Bright's disease[1] we found marked changes in the renal ganglia, of a character showing increased fibrous tissue and atrophy of the ganglion cells. These were associated with decided alterations in the renal vessels, as exhibited to you in these micro-photographs, which will make the matter clearer to you than I can from description. This condition in the renal ganglia has been confirmed by Saundby,[2] who, however he differs with our conclusions, has seen exactly the same pathological lesions.

I shall proceed to present to you the statement based upon eleven cases, accurately observed, in which the cervical ganglia from which the cardiac nerves arise were minutely examined; and five of these cases, which tell the tale of all, I will give you in some detail. The records relate particularly to the inferior cervical ganglia, giving off mainly the inferior cardiac nerve. All of the cases were interstitial nephritis; 9 were chronic contracting kidneys, and 2 contracting kidneys of more acute form.

Case I.—Emma H., æt sixty-five, admitted into the Pennsylvania Hospital May 18, 1885; died May 18, 1885; admitted for cerebral hemorrhage; had vomited; was unconscious, and completely relaxed or paralyzed; had a few irregular convulsive movements; two quarts of highly albuminous urine were drawn by catheter; she died in three hours. Post-mortem examination showed an extravasation of blood in the external part of the left hemisphere, but it had not extended to the ventricles. Death resulted in this case apparently from uræmia, rather than from the cerebral clot directly. The

[1] American Journal of the Medical Sciences, July, 1880.

[2] British Medical Journal, Jan. 13, 1883.

kidneys were very much reduced in size, with thickened capsules and granular surfaces, dotted with small cysts. The left ventricular wall was much thickened, measuring over one inch. The minute structures of the inferior cervical ganglion showed many marked changes; the ganglion cells were deeply pigmented, appeared shrivelled or compressed; equally to be noticed was the tissue around the ganglion cells, composed of a delicate fibrillar tissue, in which appeared very numerous round and spindle nuclei. Some of these nuclei were doubtless those of the nerve structures, but the majority were a new growth of connective and fibrillar elements; in places they were so numerous as to obscure the ganglion cells. In the greater part the vesicular nucleus of the ganglion cells could be seen, but the nucleus was generally visible, faintly stained with carmine. A very striking feature was the appearance of the vascular structures: in the first place, the capillaries seemed in some parts to pervade nearly the whole area, some with a narrow calibre carrying but a single red blood corpuscle, and from this width upward to those with six corpuscles abreast; many of these vascular tubes presented ampullar dilatations. Some of this condition can be accounted for by the mode of death, but the most was due to permanent changes. The walls of the arterioles showed the thickening so often found and described in the arterial walls in these cases of renal disease.

Case II.—Hannah G., æt. seventy, admitted September 4, 1884. No. 920. Died November 13, 1884. Had been gradually failing in health, and lately had chest symptoms and œdema; the secretion of urine had slowly diminished. On admission there was orthopnœa, the lungs were full of coarse râles and were emphysematous, rendering any accurate determination of the size and condition of the heart impossible. The apex of the heart was far to the left of the normal. There was ascites and also diarrhœa.

The heart showed hypertrophy of the left ventricle, its tissue was undergoing fatty changes and atrophy; the kidneys, although much altered, did not exhibit the marked changes of the other cases. The minute structure of the inferior cervical

ganglion cells indicated atrophic conditions; the cells were pale, with less than the normal amount of pigment (as usually seen in the ganglia of adults dying of disease), the nucleus was plainly visible, but the nucleolus stained with carmine very faintly. Between the ganglion cells the tissue was of firmer character than normal, and appeared to encircle these cells with stiff fibres. There were no round nuclei, but only flattened spindles in this space. The capillaries were not conspicuous, but the walls of the arterioles were altered, though to a less marked degree.

Case III.—Mary McG., æt. fifty-two, admitted November 3, 1884. No. 1288. Died January 30, 1885. Her history tells of a severe cold, followed by swelling of the legs; urine of dark color and much reduced in amount; later, nausea and vomiting. On admission, the urine was smoky and contained fifty per cent. of albumen; the microscope showed blood-, hyaline-, and granular-casts, and also some epithelial casts. Only twelve ounces of urine were passed in twenty-four hours. Dyspnœa and diarrhœa existed. Later came uræmic convulsions and strongly urinous odor of the breath and body. Post-mortem examination: Heart weighed sixteen ounces; right distended, left contracted and much hypertrophied. Liver small, pale, and granular. Kidneys reduced in size, firm, capsule adherent and the surface granular. The case was an acute attack of nephritis in a contracting kidney.

The microscopic examination of sections of the kidney of this case was very interesting, showing the majority of the Malpighian bodies converted into firm fibrous nodules, and only in a few places were the convoluted tubes to be seen. Here and there a Malpighian body presented somewhat of a normal aspect, with a few tubes around it in which the epithelium could be distinguished. The chief feature was the fresh outpouring of small indifferent cells, as seen in acute interstitial nephritis. The ganglion cells were in an advanced state of degeneration, full of granules, shrivelled, and the nucleus and nucleolus scarcely to be distinguished. Between these cells the tissue presented a fibrous aspect.

Case IV.—Rose B., æt. thirty-seven, admitted December 13, 1884. No. 1517. Died January 12, 1885. The attack followed gradually after pregnancy, with greatly diminished urine secretion—one-half teacupful in twenty-four hours. Diarrhœa and swelling of abdomen were noted. The lungs were full of râles, and the pleural cavities contained effusion. The heart action was rapid, the pulse "corded," the artery hard. The urine was albuminous and contained granular casts. Post-mortem examination: Pleural and abdominal effusions; old pericarditis, hypertrophy of the left ventricle, the wall measuring one and a half inches; liver showed cicatrices, possibly syphilitic; kidneys very small, the capsule thickened, the surface highly granular, the cortex had almost disappeared, while the cones were much distorted.

The inferior cervical ganglion presented even more highly altered conditions than in the previous case. In not a few instances the cells seemed to have nearly vanished, or a few grains of pigment evidenced their site. Other cells, while showing some pigment, looked blurred, shrivelled, and irregular in outline. The nucleus was misshapen, and the nucleolus was like a fragment of poorly stained matter pushed over to one side of the nucleus and attached to its wall. Around the cells the fibrous tissue formed circles, closely resembling the thickening of Bowman's capsules in a contracting kidney. Even the spindle nuclei in the tissue between the cells had lost their distinctness, and the fibres looked less firm and rigid, but coarser.

Case V.—Mary H., æt. thirty-four. Admitted January 4, 1885. No. 1647. Died January 8, 1885.

For four months had had œdema, and for two days orthopnœa. The urine contained one-sixth albumen, and hyaline and granular casts. Death was sudden. Post-mortem examination showed old pericardial thickenings; weight of organ twenty ounces, the left ventricle measured one and one-half inches. The kidneys weighed each one and one-half ounces, capsule thickened, and tightly adherent, the surface was very granular. On section, the cortex had almost disappeared, and the pyramids were much distorted.

This specimen was less well prepared for examination than the others, owing to the delay in obtaining the autopsy; but, however much the ganglion cells changed through the delay, this factor cannot account for the alterations of the tissue of the cardiac ganglion. The general conditions were the same very nearly as in the previous specimen.

I will not present to you any more details of cases, but will rather exhibit to you some microscopical drawings, taken directly from sections. Fig. 1 shows

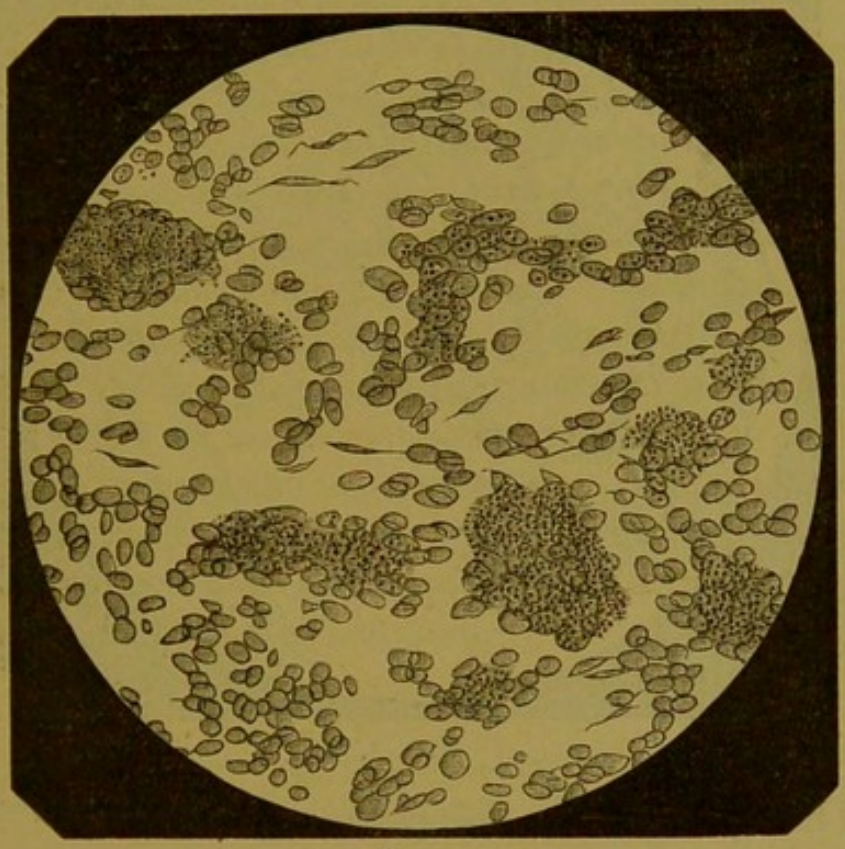

FIG. 1.

the ganglion cells, treated with the ordinary carmine staining, highly granular and pigmented, their outlines indistinct, the nucleated nucleus scarcely visible. The texture between the ganglion cells is crowded with small, rounded or spindle-shaped nuclei. These nuclei are specially numerous around and overlying the ganglion cells. The specimen is from a case in a moderately advanced stage of degeneration. Fig. 2 shows the lesion in a later stage. The whole tissue is

firm and hard looking. The ganglion cells are surrounded by rings of coarse fibres, in which are a few remaining spindle nuclei. The ganglion cell itself has greatly shrivelled; the nucleus is pressed to one side, the nucleolus showing indistinctly. In some places the ganglion cells have wholly disappeared.

FIG. 2.

These, then, are the pathological minute lesions in Bright's disease in the ganglia regulating the heart movements. Before entering into an examination of the bearing of the abnormal appearances, it may be well to answer the question, How does death come in the hypertrophied heart of Bright's disease? It comes with contraction of the left ventricle and dilatation of the right; in other words, it is a death of apnœa rather than one of asthenia. The diseased ganglia do not produce paralysis of the heart. As an instance of how even acute destruction of the ganglia will cause

death, similar as regards the heart to that in Bright's disease, I cite the following case of injury and of hemorrhage into the cervical ganglia, the autopsy of which was most carefully made by Dr. Longstreth.

Thomas McC., aged fifty. Admitted into the Pennsylvania Hospital, February 1, 1882.

The patient fell on shipboard, fractured the third, fourth and fifth cervical vertebræ, and became immediately paralyzed, both as to motion and sensation from the level of the second ribs and deltoids downward; breathing was diaphragmatic; the pupils were contracted. There was priapism and retention of urine; the heart's action was frequent and feeble. Post-mortem examination showed large clots pressing on the cervical ganglia; at the third vertebra the cord was compressed and softened. The lungs were congested; the right heart was distended, the left ventricle firmly contracted. The microscopic examination of the ganglia, especially the inferior cervical ganglion, exhibited in many places the presence of extravasated blood around the ganglion cells; some of these cells showed already changes, especially pigmentation, although but a few hours had elapsed between the accident and death; in other respects the cells and tissue of the ganglion appeared normal. The kidneys were normal.

But to return to the examination of hypertrophy of the heart in Bright's disease. I have, I trust, made clear to you that there exist, associated with the enlarged heart, marked changes in the ganglia of the sympathetic nerve, from which the cardiac nerves are derived. Is it going too far to assume that these changes are an integral part of the disease; that they may determine the hypertrophy? How, I can not explain to you exactly. It would not be difficult to bring forward a theory of loss of controlling influence on the heart, produced by the altered condition of the nervous apparatus; but our knowledge of the physiology

of the nerve supply of the heart is not accurate enough to admit of absolute reasoning from cause to effect. Still, that disturbed nerve power produces changes in structure by affecting its nutrition, we know in every tissue of the body. Why should not the same be true for the heart? Again, if we adopt this view of the derangement of nerve condition and of the vasomotor influence being the starting-point, we can readily explain the well-known lesions in the vessels, both large and small. Indeed, when we look at the wide-spread changes which occur in them in Bright's disease, especially in its chronic form; when we see everywhere accumulating the evidence that these changes happen in all the vessels of the body, in those of the spinal cord, the brain, the lungs, the liver, in veins as well as arteries—we are driven to the conclusion that there must be some general cause at work which determines so great, so universal an alteration. That general cause, from the nature of things, can only be in the blood, in the vascular system itself, or come from the nervous offices which give life to the vascular system. The change is too extensive to be a mere self-determined local growth of the coats of the vessels. We can not, indeed, ignore the agency of the waste-laden blood in its full development. But what starts the change? What is the cause of the degeneration? Is it not fair to look beside the blood, to a cause so predominant as the nervous influence, which is everywhere?

I would thus locate as most likely the original starting-point of the alteration, alike of the vessels and of the heart muscle, in the nervous ganglia and in the parts of the nervous system controlling the nutrition of these textures. What the ultimate cause

of the lesion is can not be stated, nor need we assume that one cause alone will determine it. It may be gout, it may be lithæmia, it may be rheumatism, it may be alcohol, it may be lead, it may be purely perverted nervous function from worry, from strain, from anxiety. Any one of these causes may start that alteration in the ganglionic nervous system which leads to degeneration and to the formation of increased fibrous tissue and subsequent atrophy ; and with it also to derangement in the heart and in the vascular textures supplied by the affected ganglia and nerve filaments.

These are, of course, not matters that can be at once proved or adopted. You must take them as lines of thought which have come naturally from the investigations pursued, and which promise as rich a return as any that we have had from following out views hitherto brought forward. Whether the suggestions based on these researches prove to be correct or not, I think that the observations themselves furnish one more proof of the general character of what we call Bright's disease, especially in the cirrhotic form. They show us that the primary changes are to be looked for away from the kidneys, not in them, and that there is a general disease, based on a general widespread cause, underlying the vascular alteration, heart hypertrophy, and kidney affection.

But to return from these reflections to the state of the heart in Bright's disease. Looking now at the result of all the observations and the process of reasoning by which I have endeavored to collate them ; looking at the general pathological facts which have been cited, I draw this conclusion : that the cardiac hypertrophy which is found in Bright's disease is not in any sense the consequence of that disease. It is an

integral part of the same general morbid process, of which the kidney lesion is only the most obvious expression. You may believe, with me, that it is in the nervous system that we are to search for the ultimate, or, it may be more correct to say, the original source of the malady. You may hold that this is not proved, that the changes there are only part of the general texture alteration, and are not the first; that they are result, not cause. But I trust you will see how disseminated an alteration they indicate; how everything points to a general rather than to a local malady; and not think me too venturesome in stating that chronic Bright's disease ought not to be looked upon as an affection of the kidney at all, though it is there that, to the naked eye, its most pronounced lesions occur. In adopting this conclusion, the cases that die of apoplexy, from disease of the vessels of the brain, before the kidney disease shows any signs; the cases with general vascular tension, in which there is as yet no albumen or other signs of renal malady; the cases with marked, the cases without as marked, cardiac lesion, receive their ready explanation. They cease to be objects of wonder; the mischief wrought by the general malady has been wrought more elsewhere than in the kidneys. It may exist to a greater, it may exist to a less degree in any structure; it may be diversified in very varying degree, and be present in parts in very alterable proportions.

These conclusions I draw more particularly from a study of the pathology of the contracted kidney. Perhaps it would be better to limit them to this condition, and to call this general malady Bright's disease of the kidney only so long until some one with a genius for names gives it one we can all adopt. There

may, in fact, be some of the forms of the so-called Bright's disease which are really affections of the kidney; there may be deposits or degenerative processes in the kidney simply superadded to the textural changes in the contracted organ. These intricate questions can not be here discussed; they are, indeed, with present knowledge, beyond our solution. But examined in the light of the view which we have inquired into to-night; with each group of cases looked at by itself; with the structural alterations in other organs and parts than the kidneys, minutely inspected; with the condition of the blood vessels everywhere, and of the nervous ganglia noted; with the antecedent changes as far as possible considered; it may be then that other groups will stand forth separately as showing diverse general states as their basis.

No pathological research in these days of keen induction stands long by itself. No view can be even approximately proved that we do not at once begin to search how, as practical physicians, we can make it available for the prevention or cure of disease. That the treatment of Bright's disease, and of what are regarded as its complications, is not what we wish for, is everywhere felt. If lines of investigation and of thought should lead to the recognition of the malady being a general rather than a local one, and discern its starting-point, lines of practice which are in accordance will be pursued; and it is by following these lines that helpful and hopeful results will, I believe, come. As yet, even with the wish to work in this direction, we may not have the exact agents for the purpose. But science now is too resolute to halt helplessly before obstacles when once the path beyond is clearly recognized.