The thesis on

**BRIGHT'S DISEASE**

OF THE KIDNEYS

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by

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HISTORICAL NOTICE.

It cannot be said that our knowledge of the diffuse affections of the renal organs is a very old one. Apart from a few accounts of diseased states of the kidneys found scattered through the older literature, and records of appearances found at post-mortem examinations, and independently of notices of the appearance of blood in the urine, an occurrence which even the earlier physicians had observed in the urine of persons whose kidneys were in some way diseased; apart from the clinically recognised fact that dropsy may manifest itself in persons suffering from disease of the kidneys, and the discovery of Cotugno, that the urine of dropsical subjects sometimes contains albumin,—it cannot be said that the physicians of past centuries possessed any real knowledge of the diffuse affections of the kidneys, although these were of such frequent occurrence; they did not appreciate the danger to which patients suffering from renal disease were exposed; and they were not able to diagnose kidney diseases in the living subject, or to measure their progress. This field of pathological research was first explored by Richard Bright; who, having recognised certain structural changes in the kidneys taken from the dead body, was the first person to show that the appearance of albumin in the secretion furnished by these organs might be accepted as evidence of these alterations; and he even recognised the casual relationship between affections of the kidney and other symptoms of disease, such as dropsy, in particular, hypertrophy of the left ventricle of the heart, and a variety of disorders of the nervous functions. The same observer observed that some five hundred persons died each year from renal disease alone in London. P. Rayer (Treatise on Diseases of the Kidneys) has collected a mass of literature of former times being on this subject of kidney inflammation.

It is now about eighty years since Richard Bright (1827) published the first volume of his Reports on Medical Cases; and the first chapter of these reports has the heading, "Cases Illustrative of Some of the Appearances on the Examination of Diseases terminating in Dropsical Effusion." Then, in the first part of this same chapter, the cases of Disease are described under the title, "Diseased Kidney in Dropsy," prefaced by some general remarks upon the various causes which can give rise to dropsy. Bright remarks that, up to that time too little attention had been paid to the structural changes of the kidneys as causes of dropsy, and adds that in those cases which owe their origin to disease of the kidneys he had often found the urine coagulable by heat, a property never manifested by the urine in dropsy due
to diseases of the liver. On the other hand in the bodies of those whose death had been preceded by albuminuria and dropsy, he had never failed to find anatomical alterations in the renal organs. As Bright believed, the causes of these structural alterations consisted in certain injurious influences which, either by disturbing the circulation through the kidneys or by inducing inflammation, disturbed their function. He places in one category cases of acute dropsy with albuminous urine, which began mostly by haematuria, and were the result of exposure to cold; in the other he sets cases which happened in individuals who had brought themselves down by irregular living and the abuse of alcohol. The urine derived from persons belonging to the latter category was, he found, often turbid from the presence of saline precipitates, which, however, redissolved upon the application of a gentle heat; but here the kidneys were always found in a decidedly degenerated condition, whereas in the first set of cases he sometimes encountered instances in which there was mere congestion of the kidneys. To his report of these twenty-three cases of dropsy with albuminuria Bright appendes some general remarks. His observations led him to distinguish three varieties, if not three quite totally different forms, of structural disease of the kidneys, with each of which there was associated albuminuria. He believed that the first form consisted of a state of degeneration, which might be described at its commencement as a mere enfeeblement of the organ. The kidney loses its wonted firmness, and obtains a yellow-spotted aspect, and, on section, presents this clear yellow coloration, intermixed with gray, throughout its entire cortical substance. The organ remains nearly of normal size, but its pyramids look paler than natural. This form is encountered most often in cachectic individuals - phthisical persons, for example, Bright could discover no morbid appearances in these kidneys. In the advanced stages of these forms of disease, no fluid can be injected into the supplying arteries, the organ acquires a tuberculated aspect, the elevated knobs on it being paler than the surrounding parts. An abundant interstitial exudation of an opaque substance gives rise to the second form, which is distinguished by the granular condition which characterised the entire cortical substance. At first this change in the renal substance is only recognisable as an accentuation of the natural spotty appearance of the organ, which looks as if fine grains of sand had been deposited in its substance. The kidney also seems less firm than natural, and with the advance of the disease these deposits throughout the cortical substance become more and more distinct and more numerous, so that at last the entire substance of the organ appears slightly roughened. At times it presents externally the same nodular appearance as is seen in the last stage of the first form, and it is sometimes larger, and sometimes smaller than normal. The entire surface of the kidney, in the third form described by Bright, is roughened and uneven, being covered with a countless multitude of small nodules, the size of a pinhead, some yellow, some red, and some bluish in colour.
The organ thus obtains a lobulated appearance, is hard, and cuts with as much resistance as fibro-cartilage; the pyramids are crowded closer together and approach nearer the surface than they should; in short, every part of the organ appears contracted, and the amount of interstitial deposit appears less in amount than in the second form. The pervading colour is red-gray, sometimes of a deeper, at others of a lighter hue. Although, in one instance boiling of the urine led only to the precipitation of a dense, branny sediment of a brown colour, the urine is, as a rule, highly albuminous. Still, Bright did not insist very positively upon the varieties which he had enunciated as distinct forms; but was rather inclined to allow that his first form may never pass beyond its first stage, and that what he has reckoned as later stages of its development may really be a state of things more properly appertaining to his second form: in fact, he is doubtful whether his second and third forms ought not to be regarded as mere modifications of each other, or as more or less advanced stages of one and the same morbid process. It should also be noted that he recognized other states of the kidney, connected with albuminuria, of a transitory nature, which came and disappeared again from day to day. One of the pathological conditions leading to this kind of albuminuria he described as "a preternatural softness of the kidney"; while another, according to him, consisted in the blocking up of the uriniferous tubules with white sedimentary concretions having the appearance of tiny coagula. Associated with the former of these conditions of the kidney, he had noticed a corresponding loss of firmness of the liver, the spleen, and the heart; to which last he attributed the weakness of the heart's action, noticed as a symptom during the patient's life. In the cases where the tubules were blocked up, he found the kidneys firmer than normal. The chemical constitution of the urine was ascertained by John Bostock in several of the cases reported by Bright in his treatise aforesaid, and the results of these analyses were incorporated into the work.

As may be imagined, this important discovery of Bright's did not escape the attention of his professional brethren; in fact, it attracted attention everywhere. Christison had already, in 1829, published in the Edinburgh Medical and Surgical Review, the results of his observations in the new field of discovery, the article being entitled, "Observations on the Variety of Dropsy which depends on Diseased Kidney". He was followed, in 1831, by his colleague in hospital service, James Gregory, who published a treatise in the same journal, with the title, "On Diseased States of the Kidneys, connected During Life with Albuminous Urine". Then, in the year 1834, Osborne, of Dublin, wrote a work "On the Nature and Treatment of Dropsies, accompanied by Coagulable Urine and Suppressed Perspiration", which appeared in the Dublin Journal of Medical and Chemical Science. Still, even in 1838, Christison complains, in the preface to his memoir upon Granular Degenerations of the Kidneys and their Connection with Dropsy, Inflammation and
other Maladies, that Guy's Hospital and the Edinburgh Infirmary were, up to that date, the only institutions in Great Britain that could be said to have taken anything like a practical interest in these renal affections. The authors that I have named above entirely agreed with Bright's teaching, namely, that the principal symptoms observed during life—dropsy and albuminuria—are due to pathological processes taking place in the kidneys, and to the resulting alterations in these organs; but upon the character of these pathological processes, or upon the nature of the changes which they produced in the kidneys, they advanced no more decided opinions than Bright himself.

The statement of Bright, that dropsy and albuminuria arose from some renal organic change, was soon, however, taken exception to. Thus we find that Elliotson (Clinical Lectures on Dropsy—London Med. Gaz., 1830), while admitting that albumen usually appeared in the urinary secretion during these alterations in the kidneys which Bright had described, called attention to a large number of cases which had fallen under his own observation, in which complete recovery, both from the dropsy and from the albuminuria, had taken place; and he contended, therefore, against the essential dependence of these symptoms upon the changes observed in the organs. So far as the pathological significance of albuminuria was concerned, Elliotson maintained that it derived its importance far less from the quantity of albumin in the urine, and the condition of the kidney, whatever one may interpret this to be, than from the general state of the system, which was merely evidenced by these particular symptoms. Graves (London Med. Gaz., Dec., 1831), who did not dispute the fact of the urine being albuminous, in these altered states of the kidney described by Bright, was unwilling to accept this writer's interpretation of their etiology. He regarded the albuminuria as the cause, and the pathological changes in the kidney as the result of it. "In dropsy," he says, "one perceives that there is an inclination towards a superfluous excretion of albuminous fluid throughout the body, in the kidneys as well as in every other part; but since this excretion takes place in the kidneys in the extremely fine tubules of their cortical substance, and is there mixed with urinary salts and various acids, one can hardly wonder if the albumen molecules should remain as coagula in the secreting tubes, block them up, gradually distend them, and after this way affect that obstruction of this glandular tissue to which the name of Bright's disease has been attached." Bright, in opposition to this objection, maintained his own standpoint, namely, that in the disease which he had described the mainly important item was the renal change; and besides his own Edinburgh colleagues, some at all events, of the foreign writers, in France especially Rayer, sidea with him. A number of English and French writers, on the other hand, favoured Graves' view. This very same difference of views upon the relation borne by the excretion of albuminous urine to the anatomical changes in the kidneys, first described by Bright, still prevails at the present time.
Each view, from the beginning, had its different advocates, and continued to have them, although each special pleader introduced special modifications into his argument, according to his particular ideas. The contention that the albuminous substances of the blood would be excreted by the kidneys whenever, through fever or any other cause, they were rendered unfit for assimilation, was upheld by Prout, and by other adherents of the humoral-pathological view of the case. Owen Rees and Malmsten likewise regarded the blood-change as a primary one; their belief was founded partly upon the perceptible departure from the normal condition, which the blood ordinarily exhibited in renal diseases, although they failed to show that in point of time this anomalous state of the blood preceded the renal changes, and partly upon the circumstance that albumin was often discovered in the urine during life, while after death the kidneys which had furnished it presented no departure from the normal condition. Even Valentin, who was the first person to occupy himself with the microscopical examination of diseased kidneys, thought his investigations furnished him with additional reasons for referring renal disease to antecedent blood disease; he attributed the kidney changes to precipitation of albumin from the urine. The albuminuria, however, he considered a symptom of a general disease, whose essential feature resided in the excretion of an abnormal quantity of albumin from the blood, the elimination in these cases being effected by means of the urine. An incomplete oxidation within the blood-vessels was pointed to by Robin as the cause of the albuminuria, which he said came from an imperfect elaboration of the albuminous substances in that liquid. The albuminuria was explained by Gubler as the result of an absolute or relative excess of albumin in the blood—a condition, according to him, which could be brought about by the nature of the food, by errors of digestion in the primae viae, or by disorders of the liver, or of the respiratory organs, or of the nutritional changes in the tissues—the processes of assimilation and retrograde metamorphosis. As Graves had said the same thing before him, Gubler was not the first person to give expression to the idea that functional disorder of the liver might be a cause of the presence of albumin in the urine.

The establishment of albumen as a blood disease was attempted by Jaccoud (Des Conditions Pathologiques de l'Albuminurie, Thèse de Paris) in a special contribution. The above-named writers of the humoral school of pathology were all agreed in this, that the first cause of every albuminuria lay in some blood change, and that this preceded and produced the structural changes in the kidneys. The proofs of this vague assumption, however, were entirely wanting, and nearly every one of its supporters established the cause of this presumed alteration of the blood upon some different foundation, either on disorder of the digestive or the respiratory function, or on arrest of the cutaneous functions. Jaccoud held that Gubler's theory was the only one arrived at by direct experiment; although, from what is told us, it is impossible to discover what is meant by Gubler's absolute and relative excess of albumin in the blood; neither are we informed that the presumed excess of albumin
really exists in renal disease. Jaccoud, in the previously mentioned remarks appended to his translation of Graves’ lectures, sums up the results of some observations which he had made upon two individuals affected with albuminuria; one of them, as the autopsy proved, had granular atrophy of the kidneys, while the other removed himself from observation before the termination of his case. Now, in the faeces of both these persons Jaccoud found albumin, although the intestinal membrane, examined in the body of the first named, was found to be perfectly normal; further, the cerebrospinal fluid taken from the same case contained albumin in notable quantity. From these facts Jaccoud deduced the broadest possible conclusions.

"It is plain," he says, "that throughout the whole course of the symptoms the changes in the kidney are only of secondary consideration; it is further apparent that in the state of the entire system which is, above all else, the exciting cause of these functional disturbances, since albumin does not escape alone from the diseased kidneys, but also from the extensive surface of an entirely sound mucous membrane. Hence it follows that we are not to accept albuminuria as pathological evidence of this or that disease of the kidneys, but as the visible and tangible token of some general disorder, whose grave import and incurability stand in direct ratio to the duration, and above all else to the extent of this abnormal phenomenon. Jaccoud's ideas are, however, no clearer than the confused ones of his predecessors.

One set of writers, in the study of the morbid conditions described by Bright, while they started with the assumption that some error of blood formation must be at their foundation, and addressed their attention primarily to the symptom of albuminuria, paying little or no heed to what was going on in the kidney, and being themselves much more concerned to demonstrate that the anatomical lesions of these organs are entirely subordinate and secondary to the albuminuria, another set, on the other hand, were very ready to consider that the presence of albumin in the urine was an infallible evidence of renal disease. Bright, it is true, endeavoured to guard this doctrine from such an interpretation, but yet it is difficult to draw any such meaning from his publications other than that albumin may appear in the urine at a time when the kidney structures are still perfectly sound, but that its occurrence is to be interpreted as indicating the beginning of structural changes. These changes, as Bright thought, could be made, by the skilful interposition of the physician, to recede and give place again to the normal condition; in other instances, however, they were certain to lead, sooner or later, to that condition of the kidneys first described by him—a condition admitting of no complete repair, and which establishes a disease which will of necessity lead to death—either by dropsy, or by cerebral complications, or pulmonary inflammatory disease—sooner or later.

The pupils of Bright meanwhile held that the renal affection was the starting-point of the entire train of symptoms involved in the disease, and directed their attention chiefly to the pathological changes in the
kidneys. A most careful work in this direction was soon issued by P. Rayer (Treatise on Diseases of the Kidneys, Paris, 1840, 2 vols.). Although those who had preceded him had not ventured to express a positive opinion upon the nature and essence of those changes undergone by the kidneys, and hitherto only named after Bright, Rayer did not hesitate to name them and describe them as inflammatory, and to group them together under the designation of albuminous nephritis. "The nephritis," he says, "is principally characterised, during life, by the presence of a notable quantity of albumin, with or without globules of blood in the urine, by a lesser proportion of salts and of urea in this liquid, of which the specific gravity is nearly always lower than in the healthy state; finally, by the coincidence or the ultimate development by dropsy particularly of the cellular tissue and of the serous membranes. Albuminous nephritis may be acute or chronic, febrile or apyretic." Rayer, therefore, groups these several states of the kidney together as if they constituted manifestations of a single disease; and yet, at the same time, in his description of their anatomical characters, he is compelled to distinguish six different forms of his albuminous nephritis - forms, too, which he by no means invariably treats as various stages or phases of the development of one and the same process of disease. Further than to say that the two first forms distinguished by him correspond to acute, and all the rest to chronic nephritis, - he does not enter into the relations which exist between his anatomical varieties and the pathology and symptomatology of the disease. He serves up the anatomical-pathological portion of his work in a most bald and scanty manner, although he gives therein superabundant materials, and has carefully investigated the etiological relations obtaining between the diffuse renal diseases, on the one hand, and other morbid processes with their after effects, on the other. He derives his six forms of albuminous nephritis from different peculiarities in the external aspect of the kidneys, and only after he had got well on in his work does he make mention of the relation of his several varieties to their producing causes, or state under which or what influences these alterations of the kidneys are brought about. In his pathological investigations Rayer was still restricted to naked-eye investigations, although the appearance of his work, Valentin had already, with the aid of the microscope, endeavoured to arrive more accurately at the anatomical changes which the kidneys underwent in chronic albuminuria.

In the meantime to Rayer's important influence may be ascribed the fact that the inflammatory nature of all these pathological states of the kidney, which Bright had described, became pretty generally recognised, and that the first thorough pathologic-histological work was based on this doctrine, and emanated from the pen of Reinhardt (Charite-Annalen, Berlin, 1850, vol. i.). Reinhardt, as the result of his histological investigations, pointed out that the entire group of pathological states of the kidney discovered by Bright were the results of inflammation; and to this inflammation he attached the name of
diffuse nephritis, because of its general extension throughout the affected organ; but he showed that it was an inflammation which might pursue various courses, according to the causes which produced it and the constitution of the individual whom it attacked; and he explained that the entire state of things collectively described as Bright's disease belongs to no one single morbid process, but ought rather to be understood as localisations of entirely distinct processes of disease that take place in the kidneys, and which under the name of diffuse nephritis are best understood.

Frerichs, in 1851, published the results of his own contemporaneously pursued investigations (Die Bright'sche Nierenkrankheit und deren Behandlung, Braunschweig, 1851). In the minute histological investigation which he describes of those diseased states of the kidney which are associated with the excretion of albuminous urine and the extrusion of casts, one perceives that the two investigators are pretty nearly in accord. Both are agreed that the renal changes proceed in certain stages which are distinct, and follow one upon the other, and each distinguishes three such stages: a first, of hyperaemia; a second, of exudation with fatty degeneration of epithelium; and a third, of new-growth of connective tissue ending in atrophy of the organ - hyperplasia, and atrophy ultimately. For designating this process the term inflammation did not satisfy Frerichs, who thought that the word did not define the proceeding with sufficient distinctness; he felt justified, therefore, in retaining the time-honoured name of Bright's disease instead of inventing a new one. It is a noteworthy fact that both the above-named German investigators stoutly maintained the identity of the various pathological states of the kidney described by Bright and his followers, although admitting that these may originate in different ways, progress under different conditions, and therefore possibly be accompanied by very distinct trains of symptoms. Both, too, are agreed in this, that the multiplicity of the anatomical lesions, presented by the kidney in Bright's disease, form one uninterrupted chain, from hyperaemia and fatty degeneration down to atrophy of the organ, - a chain of events whose separate links are closely welded together.

From various quarters, however, objections were soon raised against the identity of the different structural alterations which had been described as occurring in Bright's disease of the kidneys. Thus, Traube, after minute anatomical investigation, asserted that amongst the results of Bright's disease could not be reckoned the changes in the kidneys due to passive congestion, although associated with albuminuria and the extrusion of casts from the uriniferous tubules. The renal changes brought about by venous congestion were included by Bamberger among the other forms of Bright's disease, and he boldly maintained its identity with them. Although Traube had already contended against the contention, it was enough for Bamberger's purpose, without further reasoning, that cylindrical casts should form in the renal tubules which were the seat of passive congestion;
for at that time the exudation of fibrin from the blood-vessels was almost universally accepted as infallible evidence of inflammation having occurred.

Before this date, pathologists had already recognised and named a condition of the kidneys, which was entirely distinct from those changes usually designated as Bright's disease, but which had, nevertheless, been included amongst these. Rokitansky (Text-book of Pathological Anatomy, Ed. 1, 1842) was the first person to describe the lardaceous kidney as the last one of the eight forms into which he divided Bright's disease. Meckel next, in 1853, demonstrated that in lardaceous degeneration, wherever this occurred, whether in the kidney, the liver, or the spleen, a peculiar substance was present that gave a peculiar colour reaction with iodine and sulphuric acid. Virchow, and many others after him, subjected this substance to further observation, and investigated more particularly the conditions under which this degeneration took place in the abdominal organs. Traube was the first to describe and indicate how this amyloid affection of the kidney, as it was termed by Virchow, could be diagnosed and distinguished clinically from other renal diseases; and since then this form of affection, although usually attended by both dropsy and albuminuria, has been generally accepted as a process quite distinct from Bright's disease, as regards both its morbid anatomy and its clinical details.

In the meantime, both in France and Germany, the idea entertained of Bright's disease was, that it some uniform and special process applicable to a whole series of pathological conditions, the views laid down by Reinhardt and Frerichs being held as explanatory of the exact mode of development and origin of the same. George Johnson, anticipating, however, both of these observers, published, in a series of memoirs, his views upon Bright's disease, showing that this affection, which had heretofore been considered to exist in one form only, existed in a variety of forms; according to him, it was not merely necessary to distinguish an acute and a chronic form, but several different kinds of disease, each one of which differed essentially from the others. This author put forward his opinions, in detail, in a large work, On the Diseases of the Kidneys, published in 1852; and in this, besides waxy degeneration, he distinguished an acute and a chronic desquamative nephritis, a non-desquamative form of the disease, and a fatty degeneration of the kidney; next to these he made out a granular fatty kidney, distinct from the last-named, and a mottled form of fatty kidney; but he supposed that his non-desquamative form subsequently passed into fatty degeneration. Johnson endeavoured to base his classification of the diffuse diseases of the kidneys upon the results of his investigations into the minute anatomy of the diseased organs. These investigations are of importance in one particular, namely, they were the first that took cognisance of those changes which the walls of the blood-vessels undergo in the disease in question. His observations have, in this respect, proved the precursors of
those subsequent researches which have once more been prominently pushed forward by Grainger Stewart, Gull, and others,—investigations which left their mark upon the history of the pathology of renal affections. Johnson's investigations were specially directed to the changes that take place in the epithelium of the renal tubules, but the condition of the tissue between them is not referred to by him. With the first stage of Bright's disease, as conceived by Reinhardt and Frerichs, Johnson's acute desquamative nephritis corresponds. His non-desquamatary form and his fatty degeneration of the kidney (which latter must not be confounded with the fatty kidney as conceived at the present day) agree, at least in part, with the second stage made by the same writers; while his chronic desquamative nephritis accords entirely with Reinhardt and Frerichs' third stage, that of atrophy, when the kidney exhibits a general process of contraction, which arises through shedding, without previous swelling, of the epithelium of the uriniferous tubules, with subsequent complete destruction of the tubes. In the smallest arteries of the organ Johnson says that a hyperplastic thickening takes place in the course of this process of contraction. This author, however, looked at matters throughout from a numerological point of view, and seems to have no hesitation in explaining pathological processes as existing for this or that particular useful purpose. He thinks that the contamination of the blood with pernicious matters is the one real cause of all these kidney diseases. The system, he believes, is engaged in an endeavour to eliminate these substances from itself, and to this end selects the route through the kidneys; the effort of the epithelium of the renal tubes to carry out this object leads to its becoming damaged, and finally to its destruction; for the cells are engaged not merely in accomplishing their normal secretory function, but in trying get rid of from the blood the substances which must not remain there.

These views of Johnson, though pretty generally accepted in England, were much criticised in Germany, where Virchow, both in his lectures (Virchow's Archiv., Bd. 4, S. 260), in 1847, and in his celebrated pamphlet, Ueber parenchymatöse Entzündung, which appeared in 1852, thoroughly sifted them. In his treatise Virchow, after acknowledging the inflammatory nature of the renal changes named after Bright, complains that the name Bright's Disease has been given, on the one hand, to all those changes which eventually terminate in granular degeneration of the kidneys, even if the process should run its course in the chronic form, without dropsy, albuminuria, or ostensible symptoms of uraemia; on the other hand, to all those conditions where albuminuria chances to arise in some slight departure of the kidney from its normal state, but one which brings in its train neither granular degeneration nor dropsy. He points, as one of the slighter forms, to that catarrhal inflammation of the renal tubes which follows the application of irritating substances like cantharides, blisters, and mustard poultices to the skin. The catarrhal inflammation thus originated, first affects the
urinary outlets, and subsequently extends backwards to the papillae and into the straight tubules. A similar state of affairs is seen in the kidney affection following cholera. "In catarrh of the renal tubules the chief change consists, first, in an increase of the number of the cells themselves, and further on, in a later stage, in an alteration of the cells, which become first more granular-looking and opaque, and afterwards present an irregular, broken outline and yellowish-gray aspect"; this is Johnson's acute desquamative nephritis. The catarrh of the renal tubules may advance to croupous inflammation, i.e., a fibrinous exudation may appear in the tubules, and extend right up even to the Malpighian bodies. This croup, then, of the uriniferous tubules is, in some measure, a graver sort or higher grade of catarrhal inflammation. Finally, Virchow describes and distinguishes a parenchymatous inflammation of the kidneys, in his third form, and thus describes it: "This consists essentially in an alteration of the epithelial cells, and principally, of course, of those which lie nearest to the Malpighian bodies in the curling tubes, in the more intricate or cross parts of the tubuli uriniferi." Virchow, as is well known, mentioned as one of the characteristics of parenchymatous inflammation, that the inflammatory exudation is taken up by the elements that compose the actual tissues, - in parenchymatous nephritis, therefore, by the epithelial cells of the tubuli. "These cells therefore swell, become cloudy, are less transparent and more granular, and are, at the same time, often more friable than they should be. Two issues are now possible: the epithelial elements either soften and smelt down into a pulpy detritus (protein jelly), or else pass into fatty metamorphosis, and finally form an emulsified milky or creamy pap." Virchow, having previously insisted that inflammation with parenchymatous exudation did not exclude the simultaneous occurrence of interstitial and of free exudation - nay, showing as he did, that all these three processes of exudation could proceed together, - only further refers to this combination of affairs, in his description of parenchymatous nephritis, to remark, that catarrhal, croupous, and parenchymatous nephritis do not uncommonly occur simultaneously, - adding, further, that it is just this combined complication which is calculated to produce the highest degree of degeneration of the kidney; and for this complex condition he advises us to reserve the name of Bright's disease, if the term is to be employed at all, out of grateful acknowledgment to Bright himself. Certainly, the slighter affections, whether croupous or catarrhal, do not entail the complete degeneration of the kidneys, but, as the result of the occurrence of parenchymatous changes, this follows.

The changes that take place in the interstitial connective tissue in the diffuse affections of the renal organs were dwelt upon by Beer; and it is to this lengthy work that Traube appealed, in 1860, in his demand that the name of Bright's disease might be given up, since it comprehended within itself four distinct processes of disease, namely: the changes of the kidney produced by
venous stasis, or congestion; amyloid degeneration; two forms of diffuse or interstitial nephritis - one of which forms, the circumsellar, was anatomically characterized by the development of connective tissue chiefly around the glomeruli; and the other, the interlobular, by a new growth of tissue principally between the tubes of Bellini. Then, besides, the clinical aspects of these two forms is different: the former, the circumsellar nephritis, pursues, as it appears, a chronic course; in it the urine soon exhibits a yellow colour and a low specific gravity, and, apart from its more or less abundant sediment, resembles that furnished by the contracting kidney; while the latter, the second form, begins with haematuria. Identical trains of symptoms are produced when contraction of the kidney supervenes, that is to say, the train of symptoms which characterizes both these forms of nephritis and the amyloid degeneration. Traube says that the changes which occur in the epithelium are indisputably of a secondary nature, and that the conception previously formed of parenchymatous nephritis must therefore be abandoned, as untenable. Furthermore, he holds fast to this opinion in opposition to Rosenstein, who asserts that the fatty degeneration that results from the processes of inflammation ought to be distinguished from that which constitutes a simple retrograde metamorphosis preceded by no inflammatory process. Swelling alone, he says, is no evidence of inflammation; the outcome of inflammation is the multiplication or proliferation of elementary parts, and not merely swelling; and believes that it is impossible, by examining fatty degenerated epithelium, to decide whether degeneration has succeeded inflammation or some other promoting cause. At a later date, Traube (Zur Pathologie der Nierenkrankheiten, Gesammelte Beiträge zur Pathologie und Physiologie, 2, Bd. 2, Abtheilung, S. 1029) proposed the name of nephritis haemorrhagica for his inter-tubular nephritis - insisting, however, in the main, upon the views previously expressed by him regarding the nature of the anatomical changes. His capsular nephritis therefore corresponds with the third stage, and his haemorrhagic nephritis with the first stage, and in some cases with the second stage of the Bright's disease of other authors. The more restricted idea entertained by the older writers is firmly held by Rosenstein on this affection; he separates it from Virchow's catarrhal nephritis as well as from the changes impressed upon the kidneys by states of congestion and from amyloid degeneration; and also describes the anatomical course of Bright's disease as consisting of three stages, after Reinhardt and Frerichs' scheme, and names them diffuse nephritis, parenchymatous nephritis, and granular degeneration of the kidneys, the latter being the result of parenchymatous nephritis. Rosenstein mentions, as the essential feature of the process, the changes brought about by parenchymatous inflammation, - using this term in the sense applied to it by Virchow, - with its ultimate destruction of the epithelium, and insists upon the circumstance that the final result, atrophy of the kidney, may be reached without the interstitial tissue
being in the slightest degree implicated, simply in consequence of the decay of the epithelium. For the most part, he says, some changes of the interstitial connective tissue, consisting at one time in fibrillar, at another in cellular hyperplasia, whose spontaneous shrinking assists in producing contraction of the gland, are found in association with the atrophy in question.

In dealing with the subject of Bright's disease Virchow, in his work on Cellular Pathology, mentions particularly how important it is, among the various conditions of the kidney to which that name had heretofore been given, to distinguish whether the changes start from the vessels, - amyloid degeneration, - from the epithelium, - parenchymatous nephritis, - or from the interstitial connective tissue, - the indurated form. He remarks that at the same time, however, it must not be overlooked that these three different forms do not always occur as well-defined varieties, clearly distinct from one another; it is more apt to be the case that two, or even all three of these forms occur at the same time and in the same kidney, and that one form of disease may have lasted a long while, and yet end at last by being complicated by one of the others, or by both of them together. The junction, in a state of marasmus, to a simple parenchymatous or interstitial nephritis of old standing, of amyloid degeneration is, he adds, the order in which they are most apt to be associated.

Dickinson, and other English writers, treat of the diffuse diseases of the kidneys much after the style of Grainger Stewart. The latter adopts in its essential features the above-expressed opinion of Virchow's, and makes it the groundwork for his exposition upon Bright's disease. On the title of his work, Bright's diseases are made to figure in the plural number. In the text he distinguishes, as quite different forms of disease, inflammation, waxy degeneration, and shrinking of the kidneys, the last form being termed by him "cirrhosis of the kidneys." At the same time he admits that atrophy of the kidneys may be also associated with the two first-named forms as a third stage. This secondary atrophy, however, may be distinguished from the primary cirrhotic shrinking of the organ by the circumstance that in the cirrhotic form the wasting is accomplished by proliferation and subsequent contraction of the interstitial connective tissue, the epithelium of the urine tubes vanishing under the compression of the growing tissue; whereas in the parenchymatous form of inflammation, on the other hand, a primary fatty degeneration and destruction of the epithelium precedes and is the cause of atrophy, and in the amyloid degeneration, the epithelium dies in situ, by necrobiosis, in consequence of the disease of the blood-vessels. Wherefore, in the cirrhotic atrophied kidney, the interstitial tissue is absolutely increased in quantity; while in both the other forms of atrophy it is increased only relatively, and merely in the measure in which the volume of the rest of the glandular substance is diminished by the epithelial destruction. The assignment of catarrhal and croupous nephritis as the first stage of parenchymatous inflammation of the kidney is the one particular in which this author
departs from Virchow's older opinions on the subject; and, among the French writers, Lecorche, principally follows the views of Dickinson and Grainger Stewart, although in some few points he differs from them; thus he refers those changes, which result from venous congestion, back again to interstitial nephritis or sclerosis of the kidneys - Stewart's cirrhosis.

Special attention has been given to the subject of Bright's disease by both Sir William Gull and Henry T. Sutton. While former writers, and not a few modern ones, as already stated, regard the diffuse renal affections as the result and evidence of some presupposed deterioration of the blood, and others, on the other hand, look upon the kidney changes as purely local affections, explaining certain more or less concomitant alterations in other organs of the body as consequences of the renal malady. Gull and Sutton put forward the view that the form of kidney atrophy named after Bright is merely a part symptom of a widespread general affection. The essential nature of this systemic affection they define to be a hyperplastic growth of the connective tissue sheaths of the arteries, and of the connective tissue immediately surrounding the capillaries, and this they call arterio-capillary fibrosis. This periarteritis may develop throughout the entire arterial system, but is found more commonly and is best established in some particular organs - as, for instance, in the arteries of the kidneys, the pia mater, the retina, the heart, the lungs, the stomach, the spleen, and the skin. These authors would have us designate this periarteritis universalis by the term Bright's disease; and the paradoxical conclusion, that the last-named affection may exist without implication of the kidneys in the process, is thus arrived at by them. They both reject Johnson's views, according to whom the kidney disease is the result of a deteriorated blood. They point to old age as the principal original cause of this disease in the walls of the vessels; but in this respect their views appear to have led them, finally, into the error of confounding the changes brought about by age throughout the system with a process that is indisputably specific. At the same time they inform us that they witnessed an extensive grade of contraction in the kidney of a boy of only nine years; and again in a case between sixteen and twenty; and in two cases between twenty and thirty, and in ten between thirty and forty, they report the same condition present. Finally, they do not attribute the symptoms observed in the course of this renal disease, as they have hitherto been referred by clinicians, to the particular state of the kidneys, and to the resulting disturbance of their functions, but seek to explain them upon the ground of these assumed changes in the vessels and consequently in the nutrition of the affected organs. Thus the dryness of the skin would be due to alteration of the blood vessels in the general integument of the body, the headache to periarteritis of the meninges, the dystpetic troubles to a corresponding state of the vessels in the gastric mucosa, and so on.

After careful pathological study, Kelsch criticises
the various existing theories on Bright's disease; and protests especially against the misuse which the German histologists have made of their implements of research, whereby they had led the workers in histology into error for years past. Bright never expressed himself positively upon the nature of the disease which he had discovered. Rayer was the first to express a decided opinion in favour of its inflammatory nature. An advance, says Kelsch; for certain forms of it certainly are inflammatory; but still an error, for all are not; and, for these last, white degeneration and granular degeneration were better terms. Kelsch especially disallows the application of the term inflammation, when attached to Virchow's parenchymatous nephritis. What Virchow understood by parenchymatous inflammation, is, according to Kelsch, only anaemic necrosis, in which the vessels and interstitial tissue of the kidney play no part at all; and in contending against this idea of parenchymatous inflammation, he employs the same arguments which Traube did before him, and in the same sense. He denies, however, Traube's assumption that an inflammatory change, cellular infiltration, occurs in the interstitial connective tissue in the pure forms of the affection described by Virchow as parenchymatous nephritis, although conceding as a rare occurrence the occasional combination of the latter form with interstitial nephritis. The term nephritis is, according to Kelsch, alone admissible when attached to the form of disease known ascontracted kidney, - Grainger Stewart's cirrhosis, Lecorche's sclerosis, - since in that condition a new formation of tissue actually does take place. The first stage of interstitial nephritis begins in the form of a deposition of embryonic cells in the interstitial tissue, sometimes with swelling of the entire organ; the next stage is characterised by the organisation of these embryonic cells into connective tissue, and ends with atrophy of the organ. The bringing together of the different forms of diffuse kidney diseases under the name of a single morbid process having three stages, is a purely artificial and arbitrary affair. The first stage recognised by different authors is entirely evolved out of their imagination, and rests on no anatomical observations whatsoever; while the second stage has nothing whatever in common with inflammation. Its characteristic feature is a primary degeneration of the epithelium. This second stage - the large white kidney, as we call it - is the result of insufficient nutrition supplied to the epithelium, which suffers in consequence retrograde metamorphosis. This state of the kidney, therefore, only arises in individuals who are very much run down by disease, whether phthisis, scrofulosis, syphilis, or some bone affection. It is associated, often, with amyloid degeneration of the vessels, and is very rarely complicated with interstitial nephritis. As a rule, no trace of inflammation is discoverable, and the capillaries and interstitial tissue remain perfectly intact. Signs of proliferation of the epithelial structures, which ought to be forthcoming if inflammation has been the cause of their degeneration, are not present in the slightest degree.
As a true interstitial nephritis may be regarded the renal affection which succeeds scarlatina, as is also that which follows small-pox, and the epithelial changes which take place in these diseases, are merely those of death of the epithelium, and, therefore, strictly secondary processes. Kelsch separates the congestive kidney from nephritis; the connective tissue remains unchanged, and the alterations are confined to the epithelium, and especially to that of the convoluted tubules. He regards the changes which characterise the kidney of cholera as being entirely different from those which are observed in inflammation; an acute necrosis of cells takes place in the cortical, and not, as Virchow said, in the pyramidal portions; Virchow's catarrhal and croupous varieties of nephritis do not exist. Kelsch, having seen, admits at the same time the possibility of the epithelium shed after an attack of cholera being replaced with a new growth of epithelium. Other points bearing upon the subject will hereinafter appear.

As regards chronic Bright's disease the results of much patient and painstaking research have been published in the past, and make interesting reading for the student of the history of the malady. Thus Richard Thoma, of Heidelberg, has specially studied the vascular lesions of interstitial nephritis, with special reference to the disturbances of the renal circulation in this affection. Numerous experiments were made with both normal and granular kidneys to ascertain their comparative permeability to injections through the renal artery. Fresh kidneys were used, which had been removed at the earliest possible moment, generally from six to twelve hours after death, in order to obviate as far as possible the disturbing influence of rigor mortis of the muscular layer of the renal vessels. Human blood not being obtainable in sufficient quantities, defibrinated ox-blood was used in a few instances, but generally Thoma employed, as more satisfactory in their results, either a solution containing 8 per cent. of gelatin and 7.5 per cent. of chloride of sodium, or an aqueous solution of gelatin without the salt. These comparative experiments showed that not only the outflow from the renal vein was absolutely less in granular than in normal kidneys, but also that the outflow as compared with the amount injected into the renal artery was relatively diminished in granular conditions of that organ. Two causes are assigned by Thoma for the result named: (1), the reduced calibre of the renal artery and its branches, and the obliteration of the numerous minute vessels by the interstitial process, and (2), the increased permeability of the vascular walls. The latter factor retards the circulation by permitting the more rapid escape of fluid from the vessels into the surrounding tissue, and thus disturbing the peripheral layers of the blood-current, while, on the other hand, the blood-vessels themselves are compressed by the transuded fluid. It was noticed, however, that the diminution in the outflow of injections did not always stand in direct proportion to the amount of renal disease. Thus, while in less marked forms of contracted kidney the resistance to the
blood-current generally corresponded to the degree of interstitial proliferation, quite a free transit of injections was sometimes observed in advanced stages of the affection, probably on account of certain changes in arterial distribution, which I shall later on refer to. Furthermore, Thoma made careful comparative measurements, upon healthy and contracted kidneys, of the sectional areas of the renal artery, of the interlobular artery midway between the pyramids and the capsule and also near the capsule, of the vas afferens glomeruli and of the Malpighian vessels. These measurements were made upon healthy kidneys, from the time of birth up to 43 years of age, and were compared with the changes in size of the organ at corresponding periods of life. It was found from an average of sixty measurements and weighings, that the normal kidney grows between birth and the thirty-sixth year from a weight of fourteen grammes to one of one hundred and fifty grammes, while the sectional area of the renal artery increases from two and one-half to thirty-six square millimetres, thus showing that the calibre of the artery increases much more rapidly than the size of the kidney, and, therefore, sends to the organ a much greater supply of blood relatively to the size of the kidney, after the thirty-sixth year than in early life. Thoma attaches importance to this relatively increased vascularity after the completed growth of the kidney as favouring the influence of direct causes in the production of connective tissue proliferations within the kidney in middle and advanced life. Measurements of the interlobular artery and smaller arteries gave a similar result. In contracted as compared with healthy kidneys, the sectional area of the renal artery and smaller vessels was generally slightly diminished, but sometimes appeared increased, owing partly to structural changes, such as connective tissue changes in the way of thickening, calcification, and the presence of atheromatous masses, and partly also to the prevention of elastic contraction and collapse by the changes referred to. The occurrence of a considerable increase in size of the renal arteries, large and small, relatively to the weight of the organ, was the general result manifested. The raising of the arterial pressure naturally resulted from this increased arterial flux to the contracted kidneys and retarded current; and Thoma accordingly found, by introducing a mercurial manometer into the walls of the renal artery, that whereas in the healthy organ the lateral pressure of the injections averaged fourteen and one-half cm. of mercury, in granular kidneys it rose to sixteen cm., and there was considerably greater difference in the smaller vessels. The pathological increase in the permeability of the walls of the vessels is considered at greater length by Thoma in the second portion of his article. We read that experiments were made with a solution containing gelatine, Prussian blue, and chloride of sodium, and in some instances cinnabar— with the result that there was demonstrated a marked difference in the amount of transuded colouring matter in granular as compared with sound kidneys. The principal sites of transudation were the Malpighian capsules and the tubuli uriniferi contorti. A general correspondence was...
observed between the frequency of transudation and the amount of connective tissue proliferation and contraction, but the coloured masses were noticeably much more numerous in the still intact portions of the cortex, probably because the arteries were here less distorted and compressed by the contracting connective tissue, and therefore admitted a more forcible current. The increased permeability did not seem to be caused by the hyaline or fibrinous degeneration of minute arteries described by Johnson and Gull and Sutton, as it was the case apparently that these transudations were especially favoured by the unchanged glomeruli of the less diseased renal lobules. In the district of the capillary tract, similar transudations, though in a less marked degree were found. Here blue masses were often observed lying in the fissures of the connective tissue, especially in the granulating and softer tissues which characterise the beginning of the morbid process, rendering it probable that development of the neoplastic process stands in intimate relation with this increased permeability of the capillary wall. In spite of the fact that the morbid changes described directly tend to obstruct the blood-current through the kidney, there are others, in the form of modifications of the arterial distribution, which probably facilitate the circulation in contracted kidney. The most frequent of these modifications is the establishment of a direct communication between the vas afferens and the vas efferens in numerous glomeruli. Such an anastomosis may be effected by obliteration gradually of the vessel of the tuft in two ways: either the vascular loops may themselves undergo a connective tissue transformation, corresponding with the so-called hyaline degeneration, or fibrous endarteritis, as Thoma prefers to call it, resulting in the obliteration of one loop after another, until finally the single loop remaining is cut off from the stem of the glomerulus, and the vas afferens enters into direct communication with the vas efferens; or the same result may be produced without structural changes in the vessels through compression of the tuft by the connective tissue proliferation starting in the capsule, and gradually filling the capsular space. In marked cases, the two forms of atrophy may be readily distinguished. In the first, the outlines of the thickened glomerulus may be seen in the midst of the hyaline mass, while in the other form the capsular space is filled with concentric layers of neoplastic tissue, and the vascular tuft cannot be recognised. Thoma describes still another alteration of arterial distribution, in connection with cystic transformation of the glomeruli. Here also a direct communication is established between the vas afferens and the vas efferens; but, in addition to this change, the vas efferens and its branches undergo a peculiar transformation, resulting in the development of a broad capillary network with numerous anastomoses on the surface of the cyst, connected also with the vas afferens, so that the blood passes from comparatively large arterial branches into a system of wide-meshed capillary vessels, and then empties itself into venous radicles. Furthermore, as Ludwig has shown,
A few of the vasa afferentia in normal kidneys give off branches which open directly into the capillary tract. In the granular kidney, these branches are dilated and new ones formed. A further derivative influence is exerted by the collateral anastomoses with neighboring arteries, the supra-renal, phrenic, lumbar, and their minute vessels. A much larger proportion of blood than usual may be carried off by these anastomoses in abnormally high pressure within the renal vessels. Thoma, speaking of the structural alteration in the walls of the vessels, says he regards the changes as identical with the endarterial process, described by Köster, Friedländer, Trompetter, and others, as frequently occurring in connection with new formations of connective tissue. A glistening mass, resembling amyloid substance, but giving no corresponding reaction, lies on the outer surface of the endothelial layer of the vessel, being bounded externally by the basement membrane, or, when this is wanting, by the circular muscular layer. The lumen of the vessel is frequently, but by no means always, irregularly bulging, being narrower and broader by turns, but there is no such general and considerable narrowing as Full and Sutton suppose. Their mistake upon this point seems to have arisen from a faulty mode of measurement, which merely showed that the vascular wall was thickened as compared with the lumen. If the smaller arterial branches, for example, the middle portion of the interlobular artery, or the vasa afferentia, be carefully measured in both healthy and diseased kidneys, it will be found that, notwithstanding the very considerable thickening of the wall, the absolute size of the lumen is generally unchanged, or is even increased. In some places, however, where there is much thickening of the wall, the entire vessel may be considerably narrowed and contorted in shape. The muscularis is apparently stretched by the new growth of tissue, and at certain points is decidedly thinned or entirely wanting, the thickened connective tissue, which passes over without sharp limits into the products of proliferated interstitial tissue, causing atrophy and replacing its cellular elements. The glistening masses, situated between the endothelial layer of the intima and the elastic lamella of the larger branches of the renal artery, consist of closely apposed longitudinal bundles of fibres with numerous spindle-shaped cells. In marked cases, these bundles are more distinct, and present rhomboidal interspaces with oval nuclei surrounded by a delicate granulation, indicating a thin protoplasmic body. Exceptionally, the thickening of the vessels at some points is much more voluminous, so that the lumen is narrowed by several millimetres, or it may be completely occluded. In such cases the tissue intervening between the endothelium and the elastic coat contains numerous capillaries, and large rounded or oval nuclei, surrounded by a broad layer of protoplasm. The interspaces of this network are occupied by protoplasmic bodies, containing large nuclei, the whole appearance indicating a rapid growth of new connective tissue. In the renal artery the connective tissue process in the tunica media is complicated by calcification and softening atheromatous masses, otherwise the changes here are analogous to those just given.
In reading over Thoma's description of the arterial changes observed by him it is apparent that he failed to discover the muscular atrophy upon which so much stress was laid by Johnson and his followers, and that his views coincide very closely with those advanced byull and sutton, so far at least as the renal process is concerned. No mention is made or any hypertrophy of the arterial muscular coat; in fact, the changes in this tissue, when any were noticed, were rather in the direction of the fact of the proliferating connective tissue inducing atrophy from stretching.

Senator, of Berlin, has fully discussed the relations of hypertrophy or the heart to disease of the kidney, with special reference to the form of cardiac hypertrophy, commonly associated with chronic interstitial nephritis. In agreement with Roberts, Dickinson, Grainger, Stewart, and most English writers, with Kelsch and Lecorché among French authorities, and with Bartels in his opposition to the prevalent German opinion, Senator adds cirrhosis of the kidney in its typical form as a distinct affection, which is not necessarily associated with or dependent upon parenchymatous or diffuse nephritis, and which is characterised, at least in its initial and middle stages, by the secretion of excessive quantities of pale, clear urine, of low specific gravity, with either moderate amounts of albumin, or none at all, and generally containing, except towards the end of the disease, a normal quantity of urea and other specific ingredients of the urine. Furthermore, this affection is accompanied, in a large proportion of cases, by hypertrophy of the left ventricle of the heart. The occurrence of this cardiac lesion in all forms of Bright's disease, but especially in renal cirrhosis, has been recognised ever since the time of Bright, but the existence of two forms of cardiac hypertrophy in this connection, viz., the eccentric hypertrophy or hypertrophy with dilatation, and simple or concentric hypertrophy, and the important bearing of this fact upon pathogenetic relations of cardiac hypertrophy to disease of the kidneys had not received sufficient attention hitherto. The hypertrophy of the heart is generally of the simple variety in pure forms or chronic interstitial nephritis; and in proof of this contention, Senator adduces his own experience as well as the evidence afforded by the statistical tables of Traube, Dickinson, Bartels, Buhl, and Galabin. On the other hand, in chronic parenchymatous nephritis, as well as in renal cirrhosis when the latter is complicated with arterial sclerosis and roughness of the aortic valves, or by inflammation of the endocardium, pericardium, or pleura, dilatation generally accompanies the hypertrophy of the heart.

It will be seen that, to consider first the cardiac hypertrophy associated with chronic parenchymatous nephritis, and here hypertrophy of the heart is admitted to be much less frequent than in renal cirrhosis, after deducting the cases in which valvular defects or other obstructive lesions are present, only isolated cases remain to be otherwise explained. That same obstacle to the outflow of blood from the heart exists also even in
these cases is clear from the fact that the hypertrophy is associated with dilatation, and such obstruction, in the absence of gross mechanical interference, can be found only in increased aortic tension. Now in chronic parenchymatous nephritis there are no general arterial changes, such as exist in renal cirrhosis, by which the blood-pressure in the aorta can be raised, nor can the retention of water in the blood, in consequence of deficient urinary secretion, produce this result permanently, for an excess of water is soon discharged from the blood, either by the increased activity of various secreting organs or by the occurrence of oedema. We are compelled, therefore, to refer the abnormal aortic pressure to blood-changes, especially to the overloading of the blood with urea. Ustimowitch and Gritzner have shown that urea injected into the blood increases the aortic pressure, so that we have here a sufficient explanation for certain cases of cardiac hypertrophy, but probably for only a small minority of instances. For, to produce this result, not only must the accumulation of urea in the blood be long continued or frequently repeated, but the general nutrition of the same time be well maintained, otherwise but little urea is formed, and atrophy rather than hypertrophy of the heart ensues; in parenchymatous nephritis, the great rarity of this combination is too obvious to require emphasis. However, still greater difficulties are encountered in passing on to the relation of hypertrophy of the heart to renal cirrhosis. All theories hitherto advanced, except that propounded by Gill and Sutton, are based upon the supposition that the hypertrophy of the heart is secondary to the renal disease, and differ only as to the mode in which this result is produced, whereas there is no conclusive evidence that the hypertrophy of the heart may not be primary, or at least be a co-ordinate symptom of a general systemic disease. As the cardiac hypertrophy is usually here of the simple variety, that is, unattended by dilatation, the physical signs usually relied upon for the detection of ordinary forms of hypertrophy, such as depression of the apex in the longitudinal axis of the heart and increased dulness in the same direction, are here unavailable. So also the diagnostic indications for simple hypertrophy indicated by Traube, viz., abnormal resistance of the apex beat in its usual direction and situation, a louder diastolic aortic sound of an elevated pitch and ringing quality, and a more forcible radial pulse with a normal condition of the arterial wall—these too are untrustworthy, because they are merely exaggerated normal conditions, and may be variously interpreted by different observers. It is quite possible, therefore, that simple hypertrophy of the heart may be present at the very outset of a chronic interstitial nephritis, and for a considerable time during its course, without being demonstrable by physical examination. The absence of means of determining the relation of events, or of proving a direct casual relation between the two lesions, is consequently apparent. There are no renal conditions capable of explaining the development of hypertrophy of the heart in purely interstitial disease.
of the kidney. The destruction of numerous blood-vessels in the kidney, or their compression by the interstitial exudation, is certainly insufficient to raise the blood-pressure in the aorta, for Ludwig (Virchow's Archiv, Bd. 71, p. 42) has shown that even the ligation of both renal arteries fails to increase aortic tension, except for a short time. Moreover, the copious secretion of urine in this affection naturally prevents the occurrence of increased arterial pressure from retention of an excess of water in the blood, even if we admit that such an accumulation could produce this result. Nor can retention of urea and other urinary ingredients in the blood be adduced as a cause of increased aortic pressure in this connection, because in renal cirrhosis, except towards the end of the disease, the excretory function of the kidney is well performed. Finally, it remains to be explained why the cardiac hypertrophy in chronic interstitial nephritis is so frequently of the simple variety, and not, as in the parenchymatous form of disease, eccentric. In these cases of apparently simple hypertrophy, however, the possibility must be conceded that a certain amount of dilatation may be really present, although disguised by the preponderance of muscular hypertrophy, or by excessive cadaveric contraction of the ventricle. Bamberger has shown that, in stenosis of the aortic orifice, the dilatation of the left ventricle may be so slight, as compared with the marked hypertrophy, that the cavity appears no larger than usual or even contracted. On careful examination, however, the septum will often be found to bulge towards the right ventricle, thus affording additional space for the left chamber of the heart.

Whether such a condition obtains in the cardiac hypertrophy associated with the renal cirrhosis Senator Surtee is unable to decide, but if this should be proved to be the case, some obstacle to the cardiac circulation must be inferred here also. This can only be found in the increased aortic pressure, which is generally admitted to be present in renal cirrhosis, while the obstruction to the arterial circulation finds a ready explanation in the more or less widespread thickening of the minute vessels, - arteries and capillaries, - which is perhaps the most striking lesion of this form of disease of the kidneys, and this, too, whether the adventitia or the muscularis of the arteries, or both, be affected. So far the explanation rests upon the basis of well ascertained facts, but it is necessary to decide first upon the nature of the vascular changes, before any conclusion can be drawn as to their cause and their relation to renal cirrhosis, on the one hand, and to the cardiac hypertrophy which frequently accompanies it, on the other hand. The only hypotheses worth considering are the two advocated by Gull and Sutton, and by Johnson respectively, all theories which take the renal affection as the starting-point being, for reasons already given, inapplicable here. Everyone knows that Gull and Sutton held that the morbid process in the vascular system - to which they gave the name "arterio-capillary fibrosis" - is the primary disease, in which the kidneys frequently, but by no means necessarily, take part. Now the fact that renal cirrhosis
is accompanied by a marked tendency to connective tissue proliferations throughout the body, as shown by the frequent co-existence of cirrhosis of the liver, thickening of the splenic capsule, pleuritic adhesions, thickening and adhesions of the membranes of the brain and spinal cord, etc.; this fact points strongly in favour of Gull and Sutton's view, as there is no apparent way in which the systemic process can arise as the result of the renal disease. Furthermore, this theory, according to which the general arterio-capillary fibrosis may precede, accompany, or follow the renal affection, affords a satisfactory explanation of certain symptoms, which are often present at the very outset of the renal disease, or even before its first manifestations, and are very difficult to account for except on this hypothesis, such as rheumatic pains in the limbs and back, and the frequent severe headaches. On the other hand, however, the starting-point of the disease, according to Johnson, is a defective constitution of the blood, such as obtains in gout, in the dyscrasia of inebriety, in chronic lead-poisoning, etc. The malnutrition of the blood produces degeneration and destruction of the renal epithelium, whose office is to remove blood impurities, and the kidney consequently shrinks from loss of the epithelium and collapse of numerous tubules. As the intact portion of renal substance requires less blood, the supply is regulated by a corresponding contraction of the minute renal arteries, resulting, in time, in hypertrophic development of their muscular coat. In the same way, the muscular walls of other arteries of the body become hypertrophied, in consequence partly of the altered composition of the blood, and partly of the retention of urinary excreta, until finally the heart also undergoes hypertrophy, as a result of the antagonism of forces. Aside from the forced explanation which Johnson gives, for the muscular hypertrophy of the renal arteries, and from the mode in which he accounts for the contraction of the kidneys, his theory is justifiable in so far as it attributes the renal disease to dyscrasic conditions of the blood, which experience shows tends to induce cirrhosis of the kidneys. The hypothesis is, however, open to the objection of multiple causes where a single one is sufficient, since in renal cirrhosis there is usually no retention of urinary excreta, while in chronic parenchymatous disease, where such retention is present, the arterial changes in question are not observed, as Ewald has demonstrated. On the other hand, the supposition of a primary defect in the composition of the blood is entirely in accord with Gull and Sutton's theory. However, if the disguised ventricular dilatation, which we have been considering, be not actually present, that is, if the cardiac hypertrophy associated with pure renal cirrhosis be truly of the simple variety, we have here to deal with a primary or idiopathic hypertrophy, which, as in the case of every hollow muscle, cannot be caused by obstruction to the evacuation of its contents, but must depend upon some condition which, by increasing the functional activity of the organ, disposes to abnormally strong and frequent contractions. Such a condition must be found in the dyscrasic composition of the blood, to
which Johnson attributes renal cirrhosis, for a purely nervous origin of the hypertrophy, as in Basedow's disease, is probably out of the question. On this hypothesis, the admitted increase of arterial pressure can be neither the cause nor the effect of the cardiac hypertrophy. It is not the cause, otherwise we should have dilatation accompanying the hypertrophy; it cannot be the effect, for simple hypertrophy merely produces a quicker distension of the arterial wall, with a steeper line of ascent in the pulse tracing, without changing the average pressure in the arteries. This being the case, the increased arterial tension can be due only to the diffuse morbid process in the arterial system, which, as we have seen, causes the pressure of its contents to be raised. Of a twofold nature appears to be the relation between the thickening of the arterial vessels and the primary cardiac hypertrophy. Either the muscular elements of the arteries may undergo hypertrophy in consequence of the overwork to which they are subjected by the force of the hypertrophied ventricle, as Johnson supposes, or the excessive tension of the arterial walls may set up chronic inflammatory changes of the kind reported by Gull and Sutton. Indeed, there is nothing to prevent our referring both forms of arterial changes to abnormally powerful cardiac contractions. The special arrangement and abundance of the arterial vessels in the kidneys will account for the sharing of the renal arteries to such an apparently disproportionate degree in the results of this increased arterial pressure. From what has been said the conclusion is that in all cases of cardiac hypertrophy associated with renal cirrhosis — whether the enlargement is only apparent or is actually simple — thickening of the smaller systemic arteries is the essential factor in the production of the heightened aortic pressure, the difference in the two cases being that, in the one, the increased arterial tension precedes the cardiac hypertrophy as its cause, and, in the other, follows it as its result, or as a co-ordinate effect with it of a third factor — abnormal composition of the blood; the renal disease being regarded as a result or manifestation concomitant of the heightened blood-pressure and of changes in the organs of circulation, and not as the cause of the same.

We have now to consider some experiments made by Crawford and Israel, in connection with the present subject, to ascertain the effect of loss of secreting renal parenchyma in producing hypertrophy of the heart. Two series of experiments were made upon rabbits: in the first, the circulation in one kidney was arrested for from one and a half to two hours, by closing the renal artery on that side; in the second series, one of the kidneys was extirpated. As a result of the first procedure, acute parenchymatous nephritis was rapidly developed, followed in most cases, as early as the twelfth day, by changes which closely resembled, in their gross and microscopic appearances, granular atrophy of the kidney. In other cases, when bronchial catarrh, or pneumonia, or suppuration of certain wounds appeared, or when putrid fluids, even after boiling, were injected into the blood in nontoxic doses, it was noticed that, after the lapse of from
fourteen to twenty days, there was no decrease, but rather an increase in the size of the organ; the pathological findings being those of chronic parenchymatous nephritis, that is to say, the renal epithelium, instead of being removed, as in other cases, retained its position and presented marked fatty changes. According as the animals were young or had maintained mature growth, the ultimate affect of this loss of renal parenchyma, whether produced by extirpation of one kidney or by the induction of chronic interstitial or parenchymatous nephritis, was strikingly different. In the first group, the intact kidney rapidly increased in size until it attained a dimension equal to that of both kidneys in equally large rabbits. The growth of the animals was not arrested, and there was every reason to suppose from their liveliness and apparent good health that the intact kidney was performing the work of both organs, and that complete compensation had taken place. In the second group, consisting of mature animals, the compensation was less perfect. Here also the operations were immediately followed by an increase in the size of the intact kidney, but the hypertrophy after the lapse of two or three months was found to be much less than in the first group. In some of the animals, death resulted from acute or chronic uraemia in its ordinary forms; in others a state of imperfect compensation could be predicted during life from the impoverished nutrition and delicate health of the animals. Still other animals remained in good health for weeks or months, and in these the autopsy revealed an hypertrophic development of the left ventricle of the heart, equal in amount to the loss of renal substance. It was concluded, therefore, that after a loss of secreting renal parenchyma, whether induced by a cicatricial or fatty process in the kidney or by extirpation of one organ, a compensatory hyperplasia takes place in the other sound kidney, and that in young animals the function is thus completely restored, so that no cardiac hypertrophy is noticed. In adult animals, on the other hand, when the hyperplasia of the intact kidney fails to reproduce the loss of renal substance, hypertrophy of the left ventricle may ensue, but only when the cardiac hyperplasia is equal to the weight of the renal parenchyma can the compensation be complete. For the purpose of ascertaining whether the cardiac hypertrophy could be due to increased arterial pressure, experiments were also made with the manometer introduced into one of the carotid arteries. In no instance was heightened pressure detected, even when marked hypertrophy of the left ventricle was found at the autopsy in connection with advanced granular or chronic parenchymatous lesions of the kidney. It is probable, therefore, our authors conclude, that, although the cardiac hypertrophy is doubtless dependent upon the diminished renal secretion, this result is not produced through the intervention of heightened arterial pressure, but rather by the direct local action of the retained urinary excreta, which, in the same manner as they stimulate primarily the intact kidney itself, force the heart to overactivity.

In a series of sixty-two cases, C. A. Emil, of Berlin, has carefully studied the pathological changes affect-
the vascular apparatus, and he reports his observations in what may be regarded as a very important contribution to the Gull-Sutton and Johnson controversy. Ewald selected for microscopical examination the vessels of the pia mater covering the pons, not only because these vessels afford the most satisfactory preparations, and have been thoroughly studied in connection with other morbid processes, but also because the alterations found may be regarded as typical of the general vascular changes in Bright's disease. In agreement with Johnson, Ewald regards the morbid appearances described by Gull and Sutton under the term "arterio-capillary fibrosis" as due, so far as the arterioles are concerned, to changes produced in the perivascular lymph canals by the method of microscopical preparation, viz., treatment of the fresh vessels with glycerine, camphor-water, and acetic acid. By this method the boundary membrane of the lymph space is rendered more distinct, and opacities or striations caused by bendings or duplicatures of this extremely delicate membrane may readily be mistaken for pathological conditions. The indistinct nuclei or cells, which Gull and Sutton claim to have found in the otherwise homogeneous substance, Ewald maintains were merely vascular corpuscles of lymph, such as are not infrequently met with in the lymph spaces. The alteration noticed in the capillaries by Gull and Sutton, and which they describe as "thickening by a granular substance", our author regards as devoid of special clinical significance, since the same appearance is observed in connection with a variety of dissimilar affections. Therefore, the hypothesis of a special form of vascular disease, - the arterio-capillary fibrosis of Gull and Sutton which underlies the development of any form of Bright's disease, - is afforded no support by his observations. He agrees with Johnson, on the other hand, as to the very general presence of muscular hypertrophy of the arterioles when the renal disease is associated with cardiac hypertrophy. In such cases he found that the normal relation of the arterioles to the section of their walls (1:0.1 - 0.3) was changed to the proportion of 1:0.5 - 1.2, and that this abnormal thickness of the coat of the vessels depended upon enlargement of the muscular fibres, that is, upon a simple muscular hypertrophy without hyperplasia, or new formation of new elements. No change other than that just described was detected, except when atheroma, endarteritis, or calcification of the arterioles was present. Ewald came to the following conclusions with respect to the relative frequency of lesions of the vascular apparatus in chronic interstitial and in chronic parenchymatous nephritis. He says that in almost all cases of cirrhosis of the kidney, muscular hypertrophy is present in the heart and vessels. In mixed forms of renal disease where the interstitial process predominates, two-thirds of the cases present both cardiac and arterial hypertrophy only, one-third cardiac hypertrophy only; on the other hand, when the parenchymatous changes prevail over the interstitial, all the cases present cardiac hypertrophy without any similar changes in the vessels. Less than a third of the cases exhibited any
cardiac hypertrophy, and in pure parenchymatous nephritis no vascular changes were observed. In addition to this, Ewald's analysis of his cases shows that the cardiac hypertrophy in Bright's disease is not so exclusively confined to the left ventricle as is commonly supposed, as the right ventricle was found hypertrophied in about half the cases. This conclusion agrees with Bright's original observation, as well as with the later opinions of Traube and Galabin. The hypertrophy of the right ventricle Ewald regards as secondary to that of the left, the sequence being here similar to that observed in valvular defects when from one ventricle to the other extends the compensatory hypertrophy. Ewald, speaking of the relation, in point of time, between the valvular and the renal changes, says he entertains no doubt of the precedence of the latter. The arterial lesion, which is essentially distinct from the degenerative changes due to age or other general causes, is frequently met with, as Dickinson has shown, after acute nephritis from cold and scarlet fever in childhood and adolescence, therefore at a point of life when degenerative lesions from constitutional causes must necessarily be rare. The order of events, according to Ewald, may be traced as follows: Under the influence of the renal disease, blood changes are developed which increase the resistance in all the capillaries of the body. As a result of this obstruction to the circulation, the general arterial tension is raised, leading to hypertrophy of the heart. The absence of vascular hypertrophy in the renal affections complicating heart disease, in atheroma of the large vessels with cardiac hypertrophy, and the so-called heart defects show that increased arterial pressure is the main factor, however. As regards the nature of the valvular lesions in chronic Bright's disease, Dickinson takes the middle ground, viz., that the lesions in the arterioles consist partly of muscular hypertrophy and partly of fibrous changes. The latter form of thickening he found in specimens which had been prepared in various ways, showing that the appearances described by Cull and Sutton were not due to the reagents employed by them. Both forms of arterial change were observed, not only in renal cirrhosis, but also in chronic parenchymatous nephritis, in lardaceous disease, and in calcareous degeneration of the kidneys. From the fact that the same cardio-vascular lesions are often found in children dying within four weeks or six after the onset of the disease, Dickinson concludes that the changes in question are not due to a general morbid condition, but rather to the renal disease itself. No matter what may have been the final outcome of this controversy - whether muscular hypertrophy or fibroid thickening, or a combination of both processes was shown to be the essential valvular lesion in chronic Bright's disease - probably the most fruitful result of the prolonged argument was to be found in the more general recognition of the widespread constitutional character of the pathological changes which had been grouped under the general term "renal cirrhosis." One of the chief merits of the theory presented by Cull and Sutton is that it enforces this fact, and directs attention to the systemic changes which, from a diagnostic point of view, are more important than the purely renal symptoms.
The fact just alluded to was forcibly presented by Mahomed, who showed that in the increased arterial pressure of chronic Bright's disease we possess the most certain means of ascertaining that the malady is in an incipient or early stage. To quote his own words: "It has long been a well-known fact that high pressure exists in the systemic circulation both in acute and chronic Bright's disease, but it has been very generally believed that this pressure is produced by the impeded circulation of the poisoned blood, and that this poisoned condition of the blood is due to the imperfect elimination of the excrementitious material by the kidney. Thus the sequence is supposed to be: first, diseased kidney; second, retained effete materials in the blood; third, impeded circulation; fourth, the cardio-vascular changes characteristic of Bright's disease. This view makes the kidney changes primary, the cardio-vascular secondary.

I have tried, however, to prove that this sequence of events should be reversed; namely, that a poisoned condition of the blood is the primary condition, that this produces an impeded circulation through the capillaries, and subsequently the cardio-vascular changes, while the bad blood produces a congestion of the excretory organs, that is of the skin, mucous membranes, and kidneys, but especially of the latter, and that it depends upon the nature and intensity of the blood poison whether this congestion is acute or chronic. The arguments upon which this hypothesis is based are as follows: first, that high arterial pressure is found to exist before any sign of failure of the kidneys to perform their work occurs. Second, that certain poisons are known to produce kidney disease, and that these poisons produce high pressure in the arteries, while no symptoms of kidney failure are discoverable; on the other hand, the kidneys are found to be excreting rather more than their usual amount. Third, the condition of high pressure is found to occur in some young people, in all respects perfectly healthy, but liable to a certain class of petty ailments; such persons very often have a family history of gout or Bright's disease, and if they live long enough will almost inevitably develop it themselves. Fourth, far from the kidney disease being the primary condition, I find that patients with primary kidney disease, such as is seen in surgical kidneys or scrofulous kidneys, even of the most advanced nature, do not have high pressure in their arteries, while patients with acute Bright's disease, if the poison be acute and temporary, may lose all signs of high arterial pressure during their recovery, even at a time when their kidneys are manifestly crippled, the urine being albuminous, and the solids deficient in amount."

By the evidence of the pathological records of Guy's Hospital during 1877, 1875, and the first half of 1875, Mahomed shows, moreover, that "by far the larger proportion of deaths from chronic Bright's disease occur from failure, not of the kidneys, but of other organs; not only do such cases die with other symptoms than those of kidney disease, but the real cause of death is overlooked! Cardio-vascular changes were the cause of death in a large proportion of the patients. Our author gives a
table showing an analysis of the clinical aspects of 100 cases of granular kidneys, from which it appears that, of the cases presenting the symptoms of diseases other than Bright's disease, red granular kidneys found without epithelial excess, symptoms produced by cerebral haemorrhage occurred in 15; those of heart disease with valvular murmurs in 17; of these no valvular disease existed in 13, and rheumatic valvular disease occurred in 4; those of lung disease were observed in 16; of these severe bronchitis and emphysema were seen in 11, of pleurisy and pneumonia in 7, of sundry other medical diseases in 11, and of sundry surgical diseases in 13, making a total of 74 in this first group. Of the second group of cases in his table, presenting some of the ordinary symptoms of Bright's disease, mixed granular kidney being found with epithelial excess, symptoms of Bright's disease occurred before death, and were chiefly acute, in 26. Mahomed remarks: "Of these 100 cases we see that 17 died with all the ordinary symptoms of heart disease, and 15 died of apoplexy, making 32 deaths directly due to cardiovascular changes. Besides these, in the thirteen who died from surgical diseases, a good number died more or less directly from their failing hearts, degenerated vessels, and ill-nourished frames. There remain 11 who died from other medical diseases, and 18 who died from lung disease, making up the 74 deaths from failure of other organs than the kidneys. In a very large proportion of these 74 cases albuminuria was absent; when present it appeared to be due to venous congestion secondary to lung or heart disease; renal dropsy was always absent. Thus, only 26 out of the 100 met their deaths from failure of the kidneys, and all those who presented the clinical signs of kidney disease exhibited after death acute or epithelial changes in these organs; and I maintain that it is only such changes that can produce the ordinary symptoms of kidney disease, namely, albuminuria and dropsy. But Bright's disease includes more than this. It appears to me that chronic Bright's disease is caused by a condition of the blood or tissues which may be either hereditary or acquired; it may be regarded as a diathesis the existence of which can be recognised by the condition of high pressure occurring in the systemic circulation, produced by the increased resistance to the circulation of the poisoned blood in the tissues. It produces extensive anatomical changes throughout the body, but especially in the cardiovascular system, the kidneys, mucous membrane of the lungs, and gastrointestinal canal, and in the skin. The morbid changes are not necessarily present in any one of these tracts, except, perhaps, the cardiovascular; though usually visible in all it may fall with unusual severity upon either. It reveals itself during life by functional disturbance of one or all of these organs, but the disorder of any one may afford the chief clinical characteristics of the disease, and lead to an incomplete diagnosis in which its true nature is overlooked! Mahomed proceeds, after this general definition of his views to describe the signs by which the existence of high arterial pressure can be recognised. The most certain indications are, of course, afforded by the
appearances of the sphygmographic pulse-tracing. Increased arterial pressure may be inferred if any part of the tracing rises above a line drawn from the apex of the upstroke to the bottom of the notch preceding the dicrotic wave; or, if the period occupied by the portion of the tracing which corresponds to the systole, viz., from the commencement of the upstroke to the bottom of the dicrotic notch, as measured on the base line, be much more than two-fifths of the whole tracing. The height of the dicrotic notch is also a good gauge of pressure; the higher it is from the base line the higher is the pressure, and the lower is the latter the nearer it approaches the line in question. The qualities which distinguish the pulse of high pressure are, on palpation, abnormal length, persistence, and hardness, but these characteristics may not all be present at the same time. The quality of length is due to the slow, laboured, contraction of the bursa in its efforts to overcome the increased arterial resistance, while the persistence is explained by the permanent over-distension of the arteries, preventing their normal diastolic collapse. Such arteries often appear to be thickened, but the deceptive sensation communicated to the finger disappears when the vessel is examined after complete closure by compression above the point of observation. Persistence is, however, not invariably a sign of high pressure, for it is often met with in relaxed arteries through which a large but easily and rapidly flowing blood-stream is coursing. The latter condition may be distinguished by the shortness of the pulse and the absence of the heaving character of the high pressure pulse. Hardness of incompressibility is less constant as a symptom of high pressure, and is directly connected with the more powerful contraction of the heart. It may be absent, however, in vessels which are actually over-distended, but they present a weak, small, easily compressible pulse in consequence of failure of the heart. Firm compression of the vessel for some little time will generally serve for the recognition of the undue length and latest pushing character of such a pulse. An examination of the heart will furnish additional evidence in doubtful cases. Apart from the evidence of enlargement, other conditions are often sufficiently characteristic, namely, accentuation of the second sound in the aortic and not in the pulmonary area, and a reduplication of the first sound, though the latter is less constant; indeed, though high pressure exists to an excessive degree, the first sound, if the nutrition of the heart is bad, may be nearly absent, or even inaudible. Mahomed regards the existence of an habitual increase of arterial pressure as a matter of the highest importance, and as indicating (with certain well-defined tendencies to disease, especially to chronic changes in the kidney) a certain constitution or diathesis. "People who are subject of this diathesis frequently belong," he says, "to gouty families, or have themselves suffered from the symptoms of that disease; in others it may be acquired, and frequently results from lead- or alcohol-poisoning, or takes its rise in pregnancy or scarlatina. In these cases of acquired
poison the disease commences frequently in the acute form. In yet other cases there is no distinct poison to be traced; it would rather appear to result from forms of indigestion and malassimilation. The symptom of high pressure occurs very early in life; I cannot say how early. Let it be clearly understood, the existence of this abnormally high pressure does not necessarily mean disease, but only a tendency to disease. It is a functional condition, not necessarily a permanent one, though it is generally more or less so in these individuals. These persons appear to pass on through life pretty much as others do, and generally do not appear to suffer from their high pressure except in their petty ailments upon which it imprints itself; these mostly belong to one type, and are generally greatly relieved by a purge or a little dieting. In other words, their arterial pressure rises at these periods and calls for treatment. After these little attacks, their pressure often falls, and remains low for a time; gradually, however, it again commences to rise, attains too great a height, and they have another break-down. These breakdowns may be of more or less severity and frequency, according as the diathesis is more or less strongly marked; perhaps they consist of only a little 'out-of-sorts-ness', sometimes severe headaches, often hemicranial, menorrhagias in females, epistaxis in males, temporary albuminurias or haematurias, palpitations, breathlessness, sleeplessness, or the reverse, loss of memory, various neuroseal or mental disorders, severe dyspepsias, constipation, or some such troubles; if more severe they may take the form of an attack of gout, or acute Bright's disease, or of bronchitis. But the attack passes off and things remain much as before. As age advances, the enemy gains accessions of strength, perhaps the mode of life assists him, good living and alcoholic beverages make secure his position, or head work, mental anxiety, hurried meals, constant excitement, inappropriate or badly cooked food, or any other of the common but undesirable circumstances of everyday life, tend to intensify the existing condition, or, of not previously present, perhaps to produce it. Now, under this greatly increased arterial pressure, hearts begin to hypertrophy and arteries to thicken; what had previously been a functional condition tends to become more and more of an organic one. Breakdowns are now more dangerous, they happen much as before, but more serious ones begin to appear. The individual has now passed forty, perhaps fifty years of age, his lungs begin to degenerate and become emphysematous, he has a cough in the winter time, and gradually drops into a condition of chronic bronchitis, his right heart dilates, and his condition becomes more or less mixed in the aspect it presents to us, but by his pulse you will know him. Or again his symptoms take another line; his heart fails him, it can no longer perform the high-pressure work demanded of it, it therefore fails and dilates; the individual falls into a bad way; a mitral murmur appears; his pulse becomes weak and irregular, though still persistent, and so he will remain until he dies, or is relived by a timely reduction of pressure, which allows his heart to recover, and sets him on his
legs again. These cases are generally regarded as ordinary cases of mitral (or sometimes aortic) disease, but no valvular disease is usually present. In another case, the heart may not dilate severely; its hypertrophy, with some amount of dilatation, causes more or less trouble; perhaps he comes under observation for some functional disorder caused by it - one of these exacerbations previously noticed; a little albumen may now be found in the urine, the hypertrophied heart and thickened vessels may be recognised, perhaps some haemorrhages seen in his retina, and he is immediately claimed as a case of chronic Bright's disease. The kidney may have a catarrh and the albumen increase in quantity in the urine, and some dropsy appear. In other cases, the whole stress of the disease seems to fall on the kidney, and it presents the aspect of acute Bright's disease. Yet another class of individuals fail through the arteries. Atheroma is their great enemy; it may attack their aorta or large vessels so badly that they get aneurism, and fall victims to this disease. More commonly it causes general aortitis deformans, and creeping from the vessel on to the valves, in capacitates them. The case then appears to be one of aortic regurgitation, and is usually regarded as such. The pulse will usually show the more skilfully hid enemy, whom it is necessary to attack if the patient is to be relieved; it is a pulse of high pressure and is constantly full, although an aortic regurgitation murmur exists, which usually produces an empty or collapsing pulse. On the other hand, perhaps the aorta will more or less escape, while the smaller vessels, especially those of the brain, are the main object of attack. Here we shall have a few warnings; headache, vertigo, epistaxis, a passing paralysis, a more severe apoplectic seizure, and then the final blow. Take the warning which the pulse affords, reduce the arterial pressure, and the patient's life may be prolonged. Or the attack may be more insidious and more difficult to guard against; the atheromatous vessels may become plugged, or by their rigidity may seriously impede blood-supply, and softening of the brain may result. Amidst the general diffusion of atheroma, the coronary arteries may suffer severely; then the stress falls doubly on the badly nourished and overtaxed heart. Attacks of angina warn us of the impending danger, which it is indeed difficult to combat, though temporary relief may be obtained. At last on one occasion the arterial spasm or increased resistance is worse than usual, and the overtaxed heart dies paralyzed by the distension which its degenerate muscle fails to overcome. The author adds that symptoms of uraemic poisoning usher in the fatal result inevitable on the failure of the kidney. Now, if there be a Bright's diathesis, as he maintains, the only pathognomonic symptom of which is an habitual increase in the arterial pressure, and if the presence of such vascular disturbance enables us to predict the development of chronic Bright's disease long before any renal symptoms manifest themselves, the importance of Mahomed's views is obvious and the fact cannot be too strongly insisted upon. As he points out, there is nothing really new in the supposition that an habitually increased arterial pressure existing in an apparently
Healthy person, without other symptoms of disease, is really a symptom which either indicates the presence or forewarns us of the approach of chronic Bright's disease. The same opinion has been expressed by Burdon Sanderson, Handfield Jones, Saundby, Bartels, and other writers; still no one has elaborated the subject so well as he, or has so fully presented its claims to the consideration of the profession. It is quite possible that he may have exaggerated the rôle which conditions of blood-pressure play in the pathogenesis of Bright's disease; if so, the error is, at all events, in the right direction, and future criticism, even if it modify his theory as to the nexus of events, will at least award him the credit of having presented the great diagnostic value of increased arterial tension as an early symptom in cirrhosis of the kidney more forcibly than any other writer.

Da Costa and Longstreth (Researches on the State of the Ganglionic Centres in Bright's Disease) have published the results of their extended studies of this subject; and whether the lesions they have discovered in the renal plexus prove to be merely a part of the general degenerative changes in Bright's disease, or are finally demonstrated to have an etiological bearing upon the renal process, as they claim, their contribution is of interest in the study of this complex disease. While an examination of the nerve-trunks supplying the kidney gave no satisfactory results, the nerve-cells, that is the ganglia of the renal plexus, which preside over the innervation of the kidneys, presented changes which appeared to bear a direct relation to the degree of alteration in the kidneys themselves. These changes were most noticeable in the type of disease called interstitial nephritis, or contracted kidney. Incipient changes were also observed in acute and chronic parenchymatous forms of the disease, but how far these varieties are dependent upon ganglionic changes they did not ascertain. Our authors incline to the opinion that the ganglionic changes are primary; that is, that the unknown specific cause of Bright's disease, whatever it may be, acts first on the ganglionic centres in the renal plexus, and that through these are secondarily developed the renal changes by means of the faulty innervation of the kidneys. In advanced interstitial disease of the kidney, well marked ganglionic lesions were found; connective tissue proliferation, both in the capsule and in the interior of the nervous mass, fatty degeneration and atrophy in the ganglion-cells, and muscular hypertrophy and increase of connective tissue in the arteries, with collapse and closure of their lumina. The interpretation of these ganglionic lesions is difficult, the question arising as to whether they are the consequence, concomitant, or the cause of the renal lesions. That they are not the consequence our authors think is proved by the fact that the alterations are discernible in the ganglia before any tissues except the kidneys are markedly affected; but whether these changes are concomitant or cause it was difficult to decide.

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Having considered various points of historical and general interest above and noted the conflicting opinions expressed by numerous good observers there alluded to, one is now in a position to ask: What is meant by the term Bright's Disease? Briefly expressed, it is a clinical appellation given to an affection of the kidneys in which the urine exhibits certain changes; and by Richard Bright, in 1827, who found that certain cases of dropsy associated with albuminuria were due to something being wrong with the kidneys. Some authors have included under it simple degenerations and disorders of renal circulation, and others all renal affections associated with the presence of albumin in the urinary secretion; but I am of the opinion that the name in question should be abandoned and that of nephritis substituted, the latter, moreover to include all non-suppurative inflammations of the kidneys. The adjective "diffuse" prefixed to the word "nephritis" shows at once that the inflammatory changes involve both kidneys, and so is not a suppurative inflammation which would be circumscribed. It also implies that all the anatomical elements of the kidney are involved in the inflammatory process, which is now known to be the fact in all forms of Bright's disease, which affection some have defined as a bilateral haematojenous none suppurative inflammation of the kidneys. In all cases of diffuse nephritis both kidneys are affected, and generally to about the same extent. Different portions of the same kidney are not changed to the same extent, for even in advanced nephritis normal areas exist. The exciting cause of all forms of diffuse nephritis reaches the kidneys by the blood-vessels and produces first inflammatory alterations in the walls of the vessels; and, therefore, the cause being haematojenous all elements are more or less involved. It should be remembered that the finding of albumin and even a few hyaline casts in the urine does not constitute a true inflammation of the kidneys, for a very large proportion of patients may present these phenomena and yet have no renal symptoms; one is especially impressed with this fact when examining persons for admission to benefit societies, etc. The presence of hyaline casts may indicate that the individual is on the borderline of a diffuse nephritis, especially should he have albuminuria at short intervals, as it points to a certain degree of functional weakness of the glomeruli. It is quite exceptional to find healthy kidneys in persons over forty years of age when these glands are examined with the microscope; especially is this true as regards the working classes.

PLAN OF CLASSIFICATION.

A glance at the historical section above will show how varied have been the opinions of writers upon the subject of Bright's disease, as regards both its morbid anatomy and pathogenesis; the difficulties to be
encountered in attempting a satisfactory classification are therefore obvious - nor is it advisable to discuss the numerous classifications that have from time to time been proposed, as it is only by the microscope that we can ascertain the exact nature of the changes which have occurred in the kidneys as the result of Bright's disease of these glands. Some of the schematic representations have been based upon the clinical aspects of the disease, some are considered from the etiological aspect, and others from the gross appearance of the kidneys; but all of these are uncertain and open to personal interpretations. In view of this, I purpose adopting the following classification as being the most reliable, the one approved by clinical experience, and therefore eminently practicable: it is based upon the exact changes which have taken place in the kidneys as revealed by the microscope. In passing it may be noted that the results, the anatomical types, and the clinical pictures of the disease will vary as to how long the exciting poison has been acting, its quantity, and its quality. In the development of nephritis etiology plays a secondary part, as it depends on the fact that every nephritis is toxic and depends upon changes in the blood. This may be due to products of tissue waste, as uric acid; pathological products of metabolism, as intestinal ptomaines; the toxins of micro-organisms, as in diphtheria; or to specific renal poisons, as cantharides. With some observers it has been a question whether the forms of nephritis are only different stages of the same process, or whether they are from the start essentially different, one having no relation with the other. Upon a clinical basis alone it is not difficult to decide the question, and pathologically it can be proved that the different forms of kidney seen at the autopsy start as distinct processes. Most cases begin as a chronic inflammation without at any time presenting an acute stage. The true cirrhotic kidney never comes from the acute or chronic parenchymatous form, and is always primary. Some authors have argued that arterio-sclerosis is not a form of nephritis, but the fact of its being clearly a nephritis is evidenced by the clinical picture. I propose, therefore, to divide all inflammations of the kidneys into two great divisions, viz.: acute diffuse nephritis and chronic diffuse nephritis, the former generally ending in recovery and being, moreover, comparatively rare, the latter common enough and being always fatal. Furthermore, we may divide diffuse nephritis into chronic diffuse parenchymatous nephritis, and chronic diffuse interstitial nephritis. In the latter the inflammatory changes affect principally the connective tissue of the organ; but in the former the tubules and epithelial structures are primarily and permanently affected, and it follows the acute or comes on insidiously.
ACUTE BRIGHT'S DISEASE.

SYNONYMS.

Acute Diffuse Nephritis; Acute Parenchymatous Nephritis; Exudative, Catarrhal, Tubal, Desquamative, and Glomerulo-nephritis of Acute Course.

HISTORY.

Renal inflammation of an acute parenchymatous character attracted the attention of physicians long before they became acquainted with the chronic forms of inflammation of the kidneys; at least they observed that certain changes took place in the urinary secretion in this form of the disease, and referred them with greater or less certainty to certain anatomical conditions of the kidneys. Even in the eighteenth century accounts were written and observations made by medical men upon dropisy and haematuria after scarlet fever. Wells directed special attention to the character of the urine after scarlet fever, and showed that this secretion might contain albumin, even when unmixed with blood. The first person to admit the existence of inflammation of the kidneys after scarlet fever appear to have been Fischer. Bright himself, in his first publication, does not mention the influence which the scarlatinal process may exercise in exciting renal disease. But Hamilton, as early as 1833, reported that he had found the post-scarlatinal kidney, even when no dropisy had existed, in just the same condition as in the first stage of Bright's disease. Christie, too, mentions scarlet fever as a "predisposing, if not even the actual exciting cause" of granular degeneration of the kidneys (a designation under which he included every diffuse affection of these organs), and adduces two cases, to one of which he appends a short account of the post-mortem examination. The first, however, to recognise and distinguish clearly and definitely an acute from a chronic form of what he called albuminous nephritis was P. Rayer; he also recognised the fact that the acute does not by any means always pass into the chronic form, but usually only under those circumstances when the affection is left wholly to itself. He attributes acute nephritis in children to scarlet fever, and in adults to the effects of sudden changes of temperature, especially to cold and moisture, and also describes the symptoms of the disease. That acute parenchymatous nephritis passed on into the first stage of Bright's disease was maintained by the later German writers. Johnson calls it acute desquamative nephritis, and apparently allows it to originate from every cause that can give rise to renal disease. Traube named it haemorrhagic nephritis, and Lecorché "parenchymatous nephritis superficial or slight".
The lesions of acute parenchymatous nephritis vary with the intensity of the inflammatory process. To the naked eye may be distinguished two classes of kidneys according to the colour presented, namely, the pale kidney, and the dark kidney. They are either of normal size or enlarged, never small. Of diagnostic importance is the fact that their capsule is always non-adherent and their surface smooth. The pale kidneys may be soft, and the red ones are firm. The variations in colour of the kidneys do not represent different varieties of the disease, but are due to the amount of blood in the organs and the extent of the changes in the tubes at the time of death. The pale kidney represents, ordinarily, a later stage of the disease. One may examine with the microscope kidneys whose appearance to the naked eye is perfectly normal, and find well-marked changes of acute nephritis. Such kidneys are, however, rare. Pale kidneys are relatively or absolutely anaemic, and are often of a yellowish colour. Small haemorrhages or congested stars of Ferrein are seen on the surface. On the cur surface the darker medullary portion is in marked contrast to the pale cortex, which latter is swollen and the normal markings obliterated. As a rule, the glomeruli are congested and can be be distinctly seen. The most common kidneys seen in acute nephritis are those of the dark red variety, the colour depending upon the intense hyperaemia. Through these kidneys are scattered haemorrhagic portions where the red colour is intense, and the glomeruli stand out as minute red points very prominently. The medullary portion is always more intensely red than the cortex, the entire gland being also softer than normal, moist, and the distinct markings generally obliterated. In the mild non-fatal cases the microscope reveals changes that are often strikingly slight, although the urine before death may have been loaded with albumin, casts, and blood. This is especially apt to be seen in scarlatinal nephritis, where the changes are confined principally to the glomeruli. Cloudy swelling and fatty degeneration of the cells of the convoluted tubes are to be found in the cases of acute infectious diseases accompanied with albuminuria, where death is not due to the renal lesion, but to the primary disease. When to this are added the evidences of inflammatory lesions, such as exudation between the tubes and changes in the glomeruli, then a true nephritis is developed, in which latter the alterations in the vessels of the glomeruli which allow albuminous fluid, white corpuscles, and sometimes blood to escape, are the very earliest changes to be seen. In the fatal cases of acute nephritis the microscopical changes seen in the kidneys, but not all of them in every kidney, consist of haemorrhages and epithelial alterations. The former occur into the uriniferous tubes, between them, and into the capsule of Bowman. The changes in the epithelium are seen in the convoluted tubes especially, but not in all the tubes; generally in patches throughout each kidney; consisting of coagulation necrosis, especially in poisoning cases, cloudy swelling,
granulo-fatty change, and hyaline degeneration. As regards the glomeruli, it may be noted that the space between the tuft and the capsule of Bowman is filled with desquamated epithelium or emigrated leucocytes; there are cloudy swelling and granulo-fatty changes in the epithelium covering the tuft and the lining capsules; the nuclei in the tufts of the vessels are increased in number, often so extensively as to obliterate the outline of the vessels; due to a proliferation and desquamation of the endothelial cells of the vessels and to a collection of leucocytes in their lumen; there is hyaline degeneration of the glomerular vessels. Desquamated renal epithelium fills up the tubules, which also contain granular matter derived from partly or completely broken down epithelium, hyaline casts, and emigrated leucocytes. The interlobular tissue often contains the ordinary products of inflammation, serum, leucocytes, and red blood corpuscles; in severe cases round cell infiltration is seen; and the capillaries are filled with desquamated epithelium and an accumulation of leucocytes. In persons who have died from acute nephritis, signs of lobar and lobular pneumonia are commonly seen; in the brain may be found increase of the cerebro-spinal fluid and serous effusion in the meshes of the pia, while meningitis is not rare. Finally, the serous cavities, especially the pleural, pericardial, and peritoneal, generally contain fluid; and evidences of a sero-fibrinous inflammation may be observed in connection with the two first-mentioned.

ETIOLOGY.

Direct local irritation of the kidneys by toxic substances brought to them by the blood is the cause of all cases of acute nephritis. Be this substance the ptomaines of an infectious disease, the product of an organic poison, or the excess of waste products of the body, the resulting changes are the same, depending more on the amount and intensity of the poison than upon its character. What have been called different forms of acute nephritis are nothing else than distinct individual developments of the disease under its peculiar causes. Biological Toxic Agents.

Any of the acute infectious diseases may have acute nephritis associated with it, the latter being due to the walls of the vessels and the epithelial cells of the kidneys being directly acted upon by the toxins. It has been demonstrated by a number of observers that in those diseases proved to be of bacillary origin, it is not the bacilli of the disease, but their products, the toxines, carried directly to the kidneys, which cause the trouble. For example, Roux and Yersin, in the large number of cases examined by them after death, have never found the Kiels-Loeffler bacilli in the kidneys, nor when the bacilli were injected directly into the renal artery were they able to cause a nephritis; but intravenous injections of bouillon cultures free from the bacilli always produced typical diphtheritic nephritis. The frequency of the occurrence of renal complications during the course of
any of the infectious diseases depends on the natural mode of elimination of the poison of that particular disease. When other channels than the kidney are used, the complicating renal changes are rare or slight, as after typhoid fever renal complications are rare, for the poison is eliminated by the faeces, while in scarlet fever the poison being almost entirely eliminated by the kidneys, the excration by the skin being temporarily stopped, it is very usual to have acute nephritis. In the development of the latter, the amount of the poison is an important factor; and that this form generally develops when the primary disease is at its maximum is a fact well-known. It has been seen that when the cause of the nephritis was endemic the resulting character and intensity of the nephritis did not correspond to the endemic disease; thus - and especially in the case of scarlet fever - if the disease was severe the nephritis was not necessarily so, and if the endemic disease was light the nephritis would be more probably severe.

Most cases of scarlet fever are complicated by acute nephritis; in fact, the former is one of the most common causes of the latter, some observers going so far as to say that a half of all the cases of acute nephritis are due to this primary disease. The severity of the fever stands in no relation to the occurrence or intensity of the renal inflammation, for example, in the severest cases of scarlet fever the kidneys may not be affected, and again, mild cases of scarlet fever may be complicated by the most severe forms of acute nephritis. It is during the period of desquamation, in the third or fourth week of scarlet fever, that the renal complications occur. Often casts can be detected during a period of high fever and before the presence of albumin. The finding of these casts in the urine, generally associated with white and red corpuscles, often enables us to foretell the development of kidney complications days before the albumin and clinical symptoms render the diagnosis certain. Different years show different death-rates; but scarlet fever developing in males is more apt to be complicated by an acute nephritis than that developing in females, and with the first the mortality is apt to be higher than with the latter. Foodak, in the London Fever Hospital, says that he saw 5443 cases of scarlet fever in ten years, and his conclusion as to the age at which concurring nephritis occurred was that the majority of cases was between the ages of five and ten, more rarely between twenty and forty, and after forty he had never seen a case. The mortality of all the nephritis cases due to scarlet fever he found to be - males 11.3 per cent., females 5.5 per cent. - and to be 18.64 per cent. (the highest) in cases under five years. Tripe says that if we take all the cases together, we find that the kidney symptoms may be developed from the very first day of scarlet fever to the end of the ninth week - that the largest number of cases develop symptoms on the fourteenth day, the next largest on the twenty-first day, and next to this on the seventh day.

Diphtheria also, like scarlet fever, entails acute
inflammation of the kidneys. However, there is a marked
difference in the development of an acute nephritis
during diphtheria and during scarlet fever. In the first
disease, in the first place, diphtheritic nephritis ap-
pears especially in severe cases; it is estimated that 88
per cent. of the cases exhibiting the gangrenous form
have the kidneys involved. In the second place, the early
appearance of albuminuria with casts makes an early dif-
ferential diagnosis possible, as the acute nephritis de-
velops during the height of the disease. Acute nephritis is
not always indicated by the presence of albumin in the
urine during diphtheria. Empis and Bouchet found albumin
in the urine in two-thirds of their cases. It generally
appears on the third day of the disease, and is due as
often to the disturbed circulation and the high fever as
to the action of the Klebs-Loeffler bacilli. Acute neph-
ritis complicates diphtheria much oftener than it does
scarlet fever; and it has been found that there is no
relation between the severity of the diphtheria and the
presence of albumin, and that the albumin is accompanied
by no clinical symptoms of acute nephritis in these cas-
es.

It is not a common thing to find acute nephritis
as a complication of typhoid fever; and its frequency
varies in different epidemics and under different lines
of treatment. It usually occurs in the third to the four-
th week of the disease, and is usually recovered from.
Rapid recoveries are seen even in cases with very grave
urinary symptoms, such as casts and albumin in large
quantities. It sometimes happens that the urinary symp-
toms, coming on early and in a severe form, mask the ordi-
inary phenomena of the disease. This form has been called
by French and German writers the "renal form of typhoid
fever," and only the continued high fever enables us to
make a diagnosis, for acute nephritis as a complication
has not a high fever. Pneumonia, uraemia, and inflammation
of the serous membranes are especially liable to occur
during the course of an acute nephritis which complicat-
es typhoid fever; and in the latter affection sometimes
may be seen an acute haemorrhagic nephritis accompa-
nied by functional disturbances, such as bloody urine, casts,
etc. It generally comes on very early in the disease, and
often proves fatal. Even under the microscope, scarcely
any structural alteration may be seen in the kidneys.
In the majority of the cases of typhoid nephritis the
albumen and casts appear at the height of the disease,
and with the establishment of convalescence the amount
of albumin disappears.

Acute nephritis appears sometimes, but not often,
to be a complication of malarial fever; indeed, some
authors affirm that the accident is question is never
seen. A distinct haemorrhagic form has been described by
observers in Algeria, who also inform us that an acute
nephritis is most apt to develop in those cases of daily
fever accompanied by no sweating, and that the occurrence
of haematuria is usually preceded by cutaneous haemor-
hages.

It is only in very exceptional cases that erysip-
elas is associated with acute nephritis.
Though not always due to the pneumonia, albuminuria occurs in almost all the cases of the former affection. Neither is it due to the high fever, for albuminuria generally appears on the third or fourth day of the disease, and has no direct relation to the temperature. The chief factor is the infection, and the direct cause the secretion of the pneumonic poisons by the kidneys. The acute nephritis which follows pneumonia is generally mild, and almost all cases recover. It is, moreover, a rare complication. Except that the day of crisis is delayed, acute nephritis developing during the course of an acute pneumonia appears to have no influence on the pulmonary disease, and the symptoms of the former last from six to eight weeks after the latter affection is recovered from. Causard says he has seen forty-eight cases of haemorrhagic nephritis in association with lobar inflammation of the lungs.

Very seldom does acute nephritis complicate variola. It sometimes occurs in the stage of eruption, especially at the time that the pustules come out, i.e., from the sixth to the eighth day. Haematuria certainly is often present in small-pox patients, but it comes not from the parenchyma, but from the renal pelvis. On the other hand, however, such a mild disease as chicken-pox may be complicated by severe and even fatal nephritis.

Acute rheumatism is rarely associated with acute inflammation of the kidneys, and even albuminuria is not often seen in it. Chronic articular rheumatism may have an acute nephritis develop in its course.

Acute nephritis is sometimes seen - the frequency varying with the kind of epidemic - to be imprinted on an attack of yellow fever, the presence of an acute fatty degeneration of the cells, accompanied by change in the interlobular tissue, being the most prominent morbid characteristic.

Under the heading of acute nephritis one cannot classify the changes in the kidney which accompany the development of septic abscesses, miliary or embolic. Albumin, blood, epithelium, and casts, especially of the hyaline variety, sometimes appear in the urine after simple fractures of the long bones, and the phenomena of acute nephritis appear. The reason for the development of this form of nephritis has never been satisfactorily explained. It is, however, curable. Sometimes acute nephritis is established in cases of prolonged suppuration due to the elimination of septic poisons, the changes in the urine being the only signs of this affection.

It is a well-known fact that the poison of syphilis can, and often does, excite an acute nephritis; it is benefited by mercury, and has no characteristic symptoms. Rumberger says it occurs as often as in one-twelfth of syphilitic cases, as a mild form of desquamative nephritis during the eruptive stage of the disease.

Late in the course of pulmonary phthisis an acute nephritis may develop; in about a third of all the cases of the former malady albuminuria temporarily appears. On the development of the acute nephritis an improvement in the phthisical condition may be witnessed. The renal affection is here due to the absorption of septic products from the evacuations in the lungs and from
Cold.

Inflammation of the kidneys is believed to be of itself incapable of producing an inflammation of the kidneys, for animals can be shaved and exposed to hot and cold water without its occurrence. But, if the section by the skin is interfered with, as by chilling of the surface and lowering the vitality, and at the same time there is excrementitious material in the blood, the elimination of this is suddenly thrown upon the kidneys, and an inflammation of these organs may result. Moist cold and sudden exposure appear to be especially dangerous. It is not the cold, per se, that causes the trouble, but the cold plus a certain blood condition. It is a well known fact that acute nephritis often develops in those who expose themselves to cold while under the influence of alcohol. If the history of these cases in which acute nephritis apparently develops from exposure to cold was carefully examined, it would be found that either the persons were physically below par, as from fatigue, depressed nervous system, etc., or that they had been absorbing alcohol for a long time and their blood was loaded with the product of tissue waste. Many cases of acute nephritis which are supposed to be due to cold are really due to an infectious cause. In the case of alcohol especially, it is the blood condition referred to that turns the balance, and not the cold.

Chemical Toxic Agents.

Certain drugs, such as cantharides, act upon the kidneys as diuretics, but in overdoses have a toxic effect. Besides cantharides, acute nephritis has been known to occur from the internal use of turpentine, squills, and chlorate of potash; aso from medication with or absorption of carbolic acid, corrosive sublimate, balsam of Peru, and iodoform. When applied to large absorbing surfaces, the mineral acids, arsenic, phosphorus, and lead do not cause a true inflammation of the kidney, but produce degenerative changes, especially fatty. Cantharides affects both the parenchyma and interstitial tissue of the kidney and causes albumin, red blood-corpuscles, and casts of various kinds soon to appear in the urine. In severe cases death occurs early in the disease, while in mild cases recovery soon follows. Certain substances, as bile salts or salicylate of soda, may irritate the kidneys without producing an inflammation; and there are some persons possessed of kidneys whose tissue is non-resistant to almost any irritation. Authors disagree as to whether alcohol will produce nephritis in man; though when given to dogs, Renzold has seen a fatal form of inflammation of the kidneys appear. Chlorate of potash in large doses causes changes in the blood destruction of the red blood-corpuscles, etc., and finally a true inflammatory change in the kidney with a very dark scanty urine containing albumin, degenerated blood cells, and casts of broken-down epithelium. Solute poisoning by perchloride of mercury and carbolic acid produces more of a degeneration than an inflammation of the kidney, the prominent change appearing to be of the nature of a coagulation necrosis of its epithelium,
The Pregnant Condition.

It is in the second half of pregnancy, never before the third month, that we may have the occurrence of nephritis; it is seen especially in young women and those bearing twins. The symptoms are insidious in their appearance, and most of those found in acute nephritis are present, but in a mild degree, though there is always the possibility of the development of uraemia to be borne in mind. The urine is generally diminished, of high specific gravity, and contains a considerable quantity of albumin; hyaline casts are always, and granular casts generally, found. A previous renal affection is not necessarily increased by the pregnant condition. The fact that the renal lesion is due to the latter is evidenced by the rapid recovery after the uterine contents are got rid of in due course. The nephritis of pregnancy was recognised as early as the year 1842, and it was at first supposed to be due to the pressure of the gravid uterus upon the renal vessels. Now it is believed that the hydramic condition of the blood, loaded as it is with an excessive amount of waste material, causes the inflammatory changes, none of which are glomerular, they being strictly confined to the epithelial cells of the convoluted tubules. In connection with the gravid uterus, Virchow has called attention to fat embolism in the kidneys and the lungs. Leyden holds the view that the nephritis of pregnancy is due to arterial anaemia combined with fatty degeneration, this being produced either by a swelling in the cortex or a stasis in the urinary tubules. The microscope shows changes confined entirely to the epithelial elements of a granular and fatty nature, and to the naked eye the organs are anaemic-looking, of a pale yellow colour, larger than usual, and soft to the touch.

SYMPTOMS.

The onset of acute diffuse nephritis may be sudden or slow. The former is likely to be the case when the renal inflammation is developed by a sudden chill or an acute infectious disease, such as scarlatina. The patient has then one or more chills, followed by fever, pain in the back, which is increased by deep pressure, and general malaise. The urine becomes scanty and high coloured; oedema develops, and uraemic symptoms, marked by constant vomiting and convulsions, quickly supervene. These cases of sudden onset are, however, somewhat rare; for the invasion of the disease is usually of sudden occurrence, the same being evidenced from the beginning by the presence of a scanty dark coloured urine, or the disease may be so mild that the first symptoms noticed are the uraemic ones. As a rule, after a few days, there is a little oedema, especially of the eyelids. At first this is seen only in the morning, and passes away in a few hours, but later it becomes more permanent and general. As the disease advances the digestive organs are disturbed; nausea passes into persistent vomiting; constipation gives place to diarrhoea and causes loss of strength, weakness persistent headache, pains in the back and loins, swelling of
the feet, pallor of the face, dryness of the skin, and sometimes dyspnoea, are prominent early symptoms. The urine is soon greatly diminished in quantity, the patient often passing only ten or fifteen ounces in the twenty-four hours. The primary condition which caused the renal inflammation is responsible for the fever when present, which, however, is symptomatic of the disease under discussion. Should the nephritis become arrested, the fever, when present, subsides, the skin becomes moist, the oedema disappears, the nausea and headache subside, the urine becomes more profuse and lighter in colour, and gradually the patient recovers. This is the termination in nine-tenths of the cases of acute nephritis. In a few cases the albuminuria and oedema do not disappear entirely; the patient presents a waxy look, is troubled with weakness and shortness of breath; in this way the acute form of the disease merges into the chronic. In other cases which pass to a fatal termination, all the symptoms increase in severity; the urine is scanty and remains so, and to this are added nervous symptoms, constant severe headache, convulsions, which are of epileptic form and character, to be followed by stupor; and these symptoms continue constantly to the end; but these attacks sometimes do not occur at all and death may then be due to such complications as oedema of the lungs, or pericarditis.

**Analysis of the Symptoms.**

As regards the digestive tract, it may be noted that nausea, vomiting, and diarrhoea are common phenomena; the latter, however, is most commonly seen in chronic forms of the disease. Vomiting is one of the signs of uraemia; it appears also as one of the initial symptoms of acute inflammation of the kidneys, and is either reflex or due to diminished secretion of urine.

Accidents of the nervous system are the results of uraemia, and are seen in their most pronounced form in especially children and nervous individuals. Such symptoms are headache, apathy, restlessness, dyspnoea, asthmatic attacks, and muscular tremors, the latter due to cortical irritation. The nervous phenomena may be followed by epileptic convulsions, which are repeated until finally coma or death carries off the patient; or they may grow shorter and less severe until sweating and an increased flow of urine gives relief to the kidneys, and the illness is got the better of in due course.

The colour of the urine is generally dark red and turbid. Urine containing blood in quantities gives a greenish colour when held before the light. Urine passed during the night contains less blood than that passed during the day. The quantity passes is always diminished, sometimes to from five to twenty-five ounces in the twenty-four hours, and cases have been reported with recovery where only about an ounce of urine was passed daily for a number of consecutive days. Upon standing the urine generally shows a red brown coloured sediment. The specific gravity is high, 1020 to 1030. Serum albumin is present in large quantities, one-half to one per cent.; 5 to 25 gr. are passed daily. The urea is reduced to one-
The phosphates and chlorides are reduced. A microscopical examination shows fine hyaline and epithelial casts, lymphoid cells, renal epithelium, and granular matter. Often there are crystals of oxalate of lime or uric acid haematoïdin, free or in cylinders, and micro-organisms. It is in cases of diphtheria and scarlet fever that the largest number of cellular elements are found in the urine. The fact that the disease has run its course is not invariably indicated with certainty by the disappearance of albumin from the urine. In certain cases of nephritis only casts of blood are to be found, and no cellular elements. In many cases the casts appear in the urine before the albumin, and may be found even after the latter has vanished. At different times of the day the number of casts vary, though the amount of albumin is constant. Casts are not always found in the urine of acute nephritis. The higher the temperature the fewer they are; and the same is the case the longer the urine remains in the bladder, their solubility being therin due to the pepsin in the acid urine.

There is no acceleration of the pulse during the greater part of the course of an acute nephritis, and in some cases it is even very slow. In some rare cases it is often not possible to detect any changes in the pulse in the ordinary way, but the fact of the vessels being in a state of high tension can be demonstrated with the aid of the sphygmograph. There is often accentuation of the aortic second sound, but seldom hypertrophy of the left ventricle, though sometimes after two or three weeks.

The most marked change in the blood is the amount of excrementitious material present, and it is sometimes so great, indeed, that discoloration of the skin is induced. It contains more water than usual, and its specific gravity varies from 1018 to 1024. Freresichs found that albumin in the serum, instead of being from 69 to 79 per thousand, was only 51.7.

One of the most important symptoms of the renal inflammation is that of dropsy, the most important form of the latter being found in connection with the lungs, brain, and epiglottis; oedema of the glottis being a frequent cause of death. As a rule, it begins in the eyelids, then appears about the ankle and along the tibia, and finally extends up the limbs. The transparent swelling of the subconjunctival tissue, the pale red cheeks, these constitute a peculiar physiognomy which is easily diagnosed. As the dropsy becomes extensive the penis and scrotum become oedematous and fluid collects in the serous cavities. In some cases the oedemas appear to be of an inflammatory nature, and a serous lobular pneumonia may be sometimes observed. Even in otherwise very severe and fatal cases of the infectious diseases, there may be little or no dropsy. The fact of the latter being affected by the diminished amount of urine and perspiration may account for the severe dropsy after exposure to cold and after scarlatinna. The general dropsy may be so severe as to cause fissures in the skin, and thus give rise to infection, gangrene, or even erysipelas. In general, the skin is dry and harsh; there is but little tendency to sweating; it is pale, shining, without wrinkles, and presents the well-known phenomenon of pitting on.
In the presence of all the characteristic symptoms the diagnosis of the condition is usually easy. Acute nephritis should be suspected, and the urine examined in every case showing pallor of the skin and puffy eyelids, whether general prostration is present or not. The characteristic symptoms of acute nephritis are headache, restlessness, muscular twitching, dyspnoea, nausea and vomiting, a tense pulse, moderate fever, dropsy, and anaemia. The causal factors and the history of the case must always be taken into account, for, after one of the exciting causes mentioned above, albuminuria and haematuria set in, the diagnosis is no longer in doubt. Nevertheless, one must be careful not to regard every albuminuria that presents itself during the course of a severe febrile affection as an indisputable sign of a commencing inflammation of the kidneys, even though some hyaline casts be discharged with albuminous urine; even in a scarlet fever patient this does not always indicate the beginning of a nephritis, while it occurs almost without exception in every case of diphtheria that is at all severe, is not often absent in severe cases of typhus, and is common in small-pox. Although nephritis is a rare sequel of the last-mentioned processes, we are only justified in ascribing the changes in the urinary excretion to an inflammation of the kidneys, when at the same time the excretion of urine is notably diminished in quantity, or when in addition to the hyaline casts and abundance of blood casts and free red blood corpuscles are found in the sediment deposited by the cloudy and scanty urine. In such a case the speedy appearance of dropsy, if not already present, will establish the diagnosis. Still, even when bloody urine is passed by a feverish patient it does not necessarily follow that inflammation of the kidneys exists, for the blood may come from the pelvis of these organs, or be due to the presence of a febrile form of purpura. Unruh, of Dresden, says that he met with twenty-eight examples of extensive haemorrhage from the pelvis of the kidney out of two hundred and twelve post-mortems upon cases of small-pox. The bloody condition of the urine may also be due to some affection of the mucous membrane of the urinary passages. It may happen that one has considerable difficulty in diagnosing between an acute nephritis and an acute exacerbation of a chronic nephritis, for even after death the lesions of the latter condition may be found. It is, however, important to remember that of the case is one of chronic nephritis with acute exacerbation, there will be evidences of albuminuric retinitis, cardiac hypertrophy, and high arterial tension; in acute nephritis the specific gravity of the urine is high and it usually contains...
blood; in chronic nephritis the general appearance of
the patient is that of a longer illness, pallor, swelling
of the skin, etc.; and the history of the case is a fac-
tor of no inconsiderable importance, especially as re-
gards the date of the onset of the first symptoms. Finally,
a diagnosis may have to be made between a febrile albu-
minuria and one due to an acute inflammation of the
kidneys. Fever not being a symptom of the latter condi-
tion, when the nephritis and the fever appear together,
the nephritis should be considered as following the
fever; and, moreover, the history of the case and the mi-
croscopical examination of the urine will assist in de-
termining the point. So far as the diagnosis of the nep-
hris of pregnancy is concerned, one must be guided by the
points concerning the diagnosis of acute nephritis in
general. In consequence of the presence of the etiological
influence, it will be even more easily arrived at than in
cases of nephritis due to other causes. It is, of course,
necessary that the pregnancy itself should be diagnos-
ticated; and this all the more easy since the nephritis,
as a rule, is not developed before the latter half of
the pregnancy. The presence of any chronic affection of
the kidney, which may have existed before the impregnat-
on, must obviously be excluded.

PROGNOSIS.

Acute nephritis is usually recovered from in fav-
ourable cases within four weeks, though the disease has
sometimes been known to last for several weeks or even
months, and yet recover. Fatal cases almost always meet
their end early in the disease. Of the protracted cases
referred to, six months is the average period preceding
complete recovery, for as long as the urine contains
casts, even if no albumin be present, the patient is not
really cured. The prognosis will, of course, depend main-
ly upon the exciting cause; in the first place, because
some of the exciting causes are liable to be followed
by other grave complications besides the renal affect-
ton, or, even before the commencement of the latter, may
themselves occasion great disturbances of the general
nutrition and much prostration of strength, while in
other cases no changes are produced in any other organs
than the kidneys by the agent which excites the infla-
mation. Scarlet fever may be mentioned among the causes
which belong to the first category, and among those of
the second, catching cold. There is also another way in
which the nature of the exciting cause exerts an influ-
ence upon the prognosis, for the fact that the cases of
renal disease which are due to certain determined caus-
es run a more severe course than those which owe their
origin to other causes, has been shown by experience.
One cause may occasion a more profound impairment of
the physiological integrity of the renal vessels than anot-
er. This hypothesis does not exclude the possibility of
differences in the intensity of action of the same
cause; we sometimes meet with mild cases of nephritis
after exposure to cold, and with very severe cases after
diphtheria, but the general rule is not invalidated by this. The most dangerous of all the etiologically distinct forms of nephritis is certainly that which succeeds scarlet fever. This is, however, entirely due to the fact that it so frequently attacks individuals who are already greatly debilitated, or else is complicated with grave affections of other organs, which are likewise dependent upon the scarlatinal process; as, for example, sloughing of the cellular tissue in the neck; phagedenic ulceration of the tonsils or soft palate; diphtheritic inflammation of the nares, or of the middle ear, etc. When scarlatinal nephritis attacks an individual who is still vigorous, and runs its course unattended by any grave complication, it is of itself far less dangerous. But apart from the individual condition of the patient, the relative mortality of scarlatinal nephritis appears to be influenced by the character of the epidemic and the nature of the patient's surroundings. When the patient does not succumb to the original malady, the nephritis of diphtheria, as a rule, runs a mild and favourable course to recovery. That form of acute nephritis which sometimes follows acute inflammation of the skin and subcutaneous areolar tissue pursues a mild course also, and recovery rapidly ensues when the primary affection, as for example, an erysipelas, is of short duration. When, however, extensive phlegmons, or other suppurative processes in the areolar tissue of long duration are present, the symptoms of the renal affection produced by them also persist for a long time. The nephritis of empyema is liable to be specially dangerous; and the same may perhaps be said of the acute inflammation of the kidneys dependent upon extensive burns. Of the nephritis following malarial, relapsing, and other like fevers I have had no practical experience, but its occurrence should always be a matter of no small concern, as the condition, apart from its immediate danger, is said to be specially liable to become chronic. In all cases of acute diffuse nephritis, whatever the cause may be, the rule holds good that the ending may be in complete recovery, incomplete recovery marked by the development of chronic nephritis, or in death. The latter, however, very seldom occurs, as the majority of the cases recover, a few develop chronic renal inflammation only, and by transition from the acute form. Moreover, apart from the individual condition and complications, the prognosis may be set down as absolutely bad, so far as my own experience goes, in every case in which the suppression of the urine is complete, except perhaps in cases of cholera nephritis. In no such cases have I ever seen recovery take place; but then I have not seen it often occur, and the experience of other observers may be different. A case of nephritis studied by Biermer, and published in the nineteenth volume of Virchow's Archives, teaches us, however, that it is possible for the secretion of urine to be resumed, after it has been repeatedly suppressed for several days at a time. The patient in question finally died with uraemic symptoms. The cases of fatal termination in the cases of complete anuria that have come under my observation was not always ushered in with any violent symptoms.
Even in children, the most severe uraemic attacks do not invariably prove fatal. Death is almost certain to occur when, in the course of an acute nephritis, purulent effusions take place into the serous sacs or into the meninges, or when an inflammation of the lungs occurs. In general, the degree of functional activity of the kidneys furnishes the true measure of the extent of impending danger in each individual case. So long as the excretion of urine remains quantitatively below the normal mark, ly, there is a great danger of the occurrence of uraemic attacks; and the development of dropsy, or its increase if it has already set in, is unavoidable. Although the latter is not so frequently the sole immediate cause of death, still an extensive oedema of the lungs is far from being a rare cause of death in acute renal inflammation. Dropsical effusion into serous cavities and oedema of the glottis are less often the cause of the fatal ending of the illness from which the patients suffer.

**TREATMENT.**

It is necessary to bear in mind that in very many cases it is not the nephritis alone that we have to consider in our treatment, but also the complications; in many instances a proper attention to the latter fulfils in a certain sense a prophylactic indication with respect to the renal affection. This is the case, for example, when proper attention is paid to securing an early and sufficiently free outlet for the pus and to keeping the cavity of the abscess in a thoroughly aseptic condition. The same remarks apply to other exciting agents the treatment of which will also have to be considered along with that of the nephritis. The majority of cases of renal inflammation recover if properly managed, and in no disease is attention to diet and hygiene more important. Rest in bed, protection from changes in temperature, and regulation of diet will cure most cases without medication, but care must be constantly exercised until convalescence is established fully. The patient should always be kept in bed and be made to wear woollen garments next to the skin. This may often be facilitated by having blankets of that material to cover him and for him to lie upon. The room should be kept tolerably warm, properly ventilated, and free from all draughts. From the risk of inducing uraemia, all baths should be forbidden. The skin may, however, be kept in a good condition by daily sponging with tepid water, followed by gentle but rapid friction. Inunctions of oil to the surface are sometimes of service, as they act to prevent evaporation, and as diuretics by forcing the urine through the kidneys. As regards the diet, it may be noted that in severe cases, where the secretion of the urine is considerably less than it should be, where the oedema is increasing, and where uraemia threatens, the amount of food and drink should be limited to the smallest possible quantity, for example, half a pint of milk in the day. For the intense thirst, tablespoonful doses of water may be given, or ice to suck if preferred. The
surplus water in the tissues should as far as possible be got rid of by diaphoresis. Small and frequent doses of brandy or whisky may be administered when the heart is failing and the pulse is small and thready. In the course of four or five days the patient will either have died, or improved sufficiently for this starvation diet to be varied according to indications presented. In those cases in which the excretion of urine is reduced, in which there is only moderate oedema, and in which anuria does not threaten life, von Noorden gives chiefly milk, alltre and a half daily, to which he adds about 350 c.c. of sweet cream. If the patient demands more food, or if his strength is much reduced so that increased feeding is desirable, he adds rice, groats, corn-meal porridge, crack- ers or zwieback, and sterilised grape-juice, or other fruit syrups. His diet consists of the equivalent of four or five litres of milk; that is to say, of 1500 gm. of milk, 375 gm. of cream, 50 gm. of rice, 50 gm. of zwieback, 50 gm. of butter, and 20 gm. of sugar, the total heat-value of which is 2900 calories. In preference to the above dietary, some authors recommend a strictly milk alimentation. But, while the process is active, too much milk must not be given, and what is given should be properly diluted, preferably with carbonated water. As soon as the acute process begins to subside, the diet may be increased by the addition of rice and other cereals, bread and butter, fruit, and, later on, as convalescence begins to be established, meat may be added, the appetite and the digestion being the dietetic regulators. Strong meats, and thees, and beef-tea must be prohibited, but sugar and cocoa may be allowed. Such patients can, however, have very weak meat broths, veal or chicken usually agreeing with the digestion better than others, though weak beef, or mutton broth may be administered if preferred. Small quantities of fresh butter, and other fats may be allowed if the digestive powers of the patient are good. As the convalescence begins to be established and a desire for other food returns, calves'-foot jelly and similar preparations may be given, as well as light vegetables, the best being spinach, cauliflower tops, young peas, or young string-beans; the best guide to the amount of food to be administered being the appetite of the patient. Bitter tonics or hydrochloric acid diluted may be required to tempt the appetite during convalescence. Of the beverages one may allow water, plain or carbonated, mineral waters, such as lemonade, etc., and, for weak patients, water and wine or water and whisky or brandy, in small quantities. If the patient prefers milk, from four to seven pints may be given daily, diluted with carbonated water. If it causes diarrhoea, lime-water should be added to the milk, or if there is constipation, magnesia solution or citrate of magnesia may be given instead. If the liver symptoms appear, the milk may be skimmed, or butter-milk substituted. If the stomach becomes disordered, kumiss may be given in place of milk, or rice, barley, or arrow-root gruel may be substituted for it. If vomiting occurs, the stomach should be given complete rest, after which carbonated water may be allowed. The imperial drink (made by dissolving a drachm of cream of tartar in a pint of
boiling water, and adding the juice of half a lemon and a little sugar, the whole being allowed to grow cold) is a favourite beverage under these conditions. In all cases the general condition of the patient must be watched, and he must not be allowed to starve to death because a little albuminuria exists. To prevent failure of his strength when the course of the disease is slow and the illness subchronic, the diet must be increased by a small amount of meat being added to his daily fare, the effect of same upon the urine and the temperature being, of course, carefully noted. If these be unfavourably affected, the meat must be promptly discontinued and not repeated until several days have elapsed.

The system must be relieved as much as possible of its toxines, and this is done best by promoting the action of the bowels. The best eliminative is calomel, in minute doses—i.e., one-tenth of a grain—frequently repeated. If any tendency to constipation its action can be increased by means of a simple saline. Calomel has the effect of increasing the flow of the urine, relieving any uraemic symptoms, and of preventing toxæmia: it is by far the most satisfactory drug of all for use in this disease. For the relief of the kidneys by removal of the toxines, the skin must be acted upon as well as the bowels, but neither of these methods must be used when there are cardiac weakness, prostration, great dyspnoea, and inflammatory complications. If there are symptoms of uræmia and much oedema, diaphoresis should be employed, the best method being by means of the hot pack. The patient should be wrapped in hot blankets wrung out in water as hot as can be borne by the hand, and over these ought to be placed dry blankets to keep in the heat. Hot drinks inwardly and hot bottle externally will have the effect of increasing the sweating. Hot packs should be used in preference to hot baths, as they are not so depressing; they may be repeated oftener, and there is less exposure and consequent danger of taking cold. The warm bath may, however, be given in the case of robust patients suffering from acute symptoms and rapidly developing uræmia. In using it the temperature of the room should be 98°F. when the patient enters it, and then run up to 104°F or 105°F. At the same time cold should be applied to the head to relieve any congestion. The bath should last from fifteen to thirty minutes, and after the bath the patient should be wrapped in warm blankets and covered well. At first the bath should be given every second day, and afterwards once or twice a day. The best results are obtained only after two or three baths, diaphoresis being obtained from the reflex irritation of the skin. In certain cases, especially those too weak to bear the exposure and moving necessary in the above methods, hot air may be introduced under the bedclothes, either by raising and supporting them and introducing under them a protected spirit lamp, or in a specially constructed apparatus such as advertised and depicted in surgical instrument catalogues.

Drugs will be indicated in all cases in which the quantity of urine secreted is very small, urgent uræmic symptoms are developing, oedema of the lungs is thre-
ateining, and hydrothorax and ascites are interfering with circulation and respiration. Before any diuretic drugs are given for the relief of the congestion of the kidneys and to excite the flow of the urine, especially when it is rapidly diminishing in quantity, dry cups over the lumbar region should be resorted to, and followed by poultices over the part where applied. Only the milder forms of diuretics should be employed: on no account the stronger ones. Benzoate of soda and citrate of potash— one to three drachms a day—are often effective; but the best results are to be derived from tea-spoonful dose or more, three times a day, of liquor ammonii acetatis: it may be given every four hours if desired. Only in rare and desperate cases is digitalis indicated, to increase the tension of the renal vessels and so produce diuresis. The indiscriminate use of this drug does more harm than good. When the action of the digitalis on the kidneys is desired, the infusion—made from the fresh leaves only—should be used, combined with bitartrate or acetate of potash. The drug should be promptly discarded once it is seen that the flow of the urine is not favourably affected by it. Some authors speak very highly of diuretin, in doses of one to two drachms a day, and it appears to have the advantage of not contracting the lumen of the renal vessels. It should be given in solution in peppermint water after meals. But, the very best diuretic is water, of which the patient should be encouraged to drink as much as possible. Cream of tartar, one drachm to a pint of water to which half a lemon and a little sugar have been added, makes a very refreshing beverage for these cases. At every stage of the disease the action of the heart must be carefully watched. When the pulse is one of high tension five grains of chloral hydrate may be given every four hours; and if signs of heart failure appear some such cardiac tonic as the tincture of strophanthus, on the infusion of digitalis, in small doses, may be used. Minute doses of calomel combined with bismuth will often prove effective in troublesome cases of vomiting; and when the latter is constant and cannot be controlled by the use of peptonised milk or koumis, iced champagne will generally relieve it. In certain cases the relief of constipation is clearly indicated; this is done by means of drachm doses of sulphate of magnesia during the day, or a couple of ounces of the same in a tumblerful of water in the early morning. Of the symptoms which require special attention in the treatment, the first in point of importance is the complex of uraemic manifestations. The attention of the physician when treating a case of acute nephritis must always be directed to this danger, for, in spite of all care, uraemia may set in. The outbreak of a uraemic attack is sometimes preceded by complete anuria, but more usually only by a considerable diminution in the excretion of urine and of urea. The observant and careful physician will therefore find himself forewarned in time to work against the impending danger, and will endeavour to eliminate by some other channel the constituents of the urine that are retained in the body in consequence of the arrest of the renal functions. Therefore, when the first
symptoms show themselves attention should be given to
the bowels, and one of the mild hydragogue cathartics
administered forthwith. Elaterium acts promptly, but it
should be used with great care. The compound jalap powder
is safer. In strong patients, if the pulse is full and the
face congested and cyanotic, bleeding should be resorted
to; though seldom necessary, it works admirably. For uraemic
headaches ice bags may be applied, or small doses of
antipyrine, caffeine, or nitroglycerine given internally.
For uraemic convulsions chloroform - even to narcosis -
should be used. Hypodermic doses of morphia have found
favour with many observers, as, too, urethane in solution,
up to one hundred grains in the twenty-four hours. Other
drugs, such as chloral, the bromides, and oxygen do not
yield good results. Oedema of the glottis must be rel-
ieved without a moment's delay. The swelling must be
scarified, and if this is not effective, tracheotomy must
be performed, or the patient will surely die. The sooner
also that dropsy of the skin and of the serous cavities
be interfered with mechanically the better for the
patient, i.e., by tapping. Massage and bandages to the legs
will often control dropsy when beginning in the extremi-
ties in question.

Careful supervision of the patient's convalescence
must also be exercised, especially with a view to prev-
ent his catching cold. If the patient is able to take
such mild exercise as walking and riding afford, the same
may be allowed, but never to fatigue. The dietetic indi-
cations at this period have already been mentioned above.
The ferruginous tonic medicaments are always indicated
for the anaemia which exists in all cases; and a change
of air and scenery will be found to have gratifying
results in the case of patients who can afford such
indulgence.
SYNONYMS.

Chronic Diffuse Parenchymatous Nephritis; Chronic Diffuse Nephritis with Exudation; Chronic Tubal Nephritis; Chronic Desquamative Nephritis; Chronic Glomerulonephritis; Large White Kidney; Secondary or Fatty Kidney; CONTRACTED Kidney; Second Stage of Bright's Disease; Croupous Nephritis; Catarrhal Nephritis; Interstitial Nephritis; Granular, Atrophied, or Cirrhotic Kidney.

DEFINITION.

A chronic diffuse inflammation of the kidneys, accompanied by epithelial degeneration, exudation from the blood-vessels, and permanent connective-tissue changes in the parenchyma.

HISTORY.

In the year 1853, Samuel Wilks, of Guy's Hospital, was the first to prove, from actual clinical and pathological material, that the condition of the kidney, of which I am now writing, and which he described as the "large white kidney", ought not to be regarded as the precursory stage of that atrophic process which the German pathologists had proclaimed as the ultimate stage of every diffuse inflammation of the kidneys, as the third stage of their morbus Brightii. He taxes Frerichs with his failure to support his theory as to the succession of the three stages of Bright's disease assumed by him, with a single case which began with the symptoms of acute nephritis; in other words, with acute hydrops, and in which, after it had lasted for years, small, contracted kidneys had been found. He adds that his own experience has not furnished him with a single case of this sort. Wilks did not distinguish between the acute and chronic forms of parenchymatous nephritis. The clinical picture which he sketches would therefore apply only to those few cases which really have an acute commencement: an occasional happening. To the great majority of the cases his description is not applicable in the respect that the initial fever and the haematuria are, as a rule, not present. Wilks' error was recognised by Todd. The work of the former observer appears to have received little or no attention in Germany. In France, Kelsch was the most decided in admitting that the chronic renal inflammation which Wilks described under the name of the "large white kidney" was possessed of a distinct individuality. He denies its inflammatory nature, however, and asserts that Wilks did also too, which is incorrect; for, in direct contradiction to Kelsch's views, Wilks describes the
swelling of the large white kidney as the product of an inflammation which, starting from the urinary tubules, is in the early stages capable of undergoing complete resolution. He likens this process to a bronchitis. In both instances the inflammation may extend from the tubes first affected to the tissues around them; in the kidneys the entire tissue may be saturated with inflammatory exudation, while broncho-pneumonia may be the termination of the bronchitis. That the affection has an acute initial stage is denied by Kelsch, who prefers to regard it as an anaemic necrosis of the epithelial cells associated with swelling, but not implicating in the least the rest of the renal tissues. He claims that it attacks only persons whose general nutrition is reduced, e.g., phthisical, scrofulous, and syphilitic subjects; that the general anaemic causes ischaemia of the kidneys, and in this way conduces to the degeneration of the epithelium. From both an etiological and a pathological standpoint, this view has since been shown to be incorrect.

CLASSIFICATION.

Chronic diffuse parenchymatous nephritis is the most common and most important form of renal affections. As it has associated with it certain distinct morbid conditions of the kidney possessed of characteristic clinical phenomena, it is convenient and advisable to treat of the affection under three heads, remembering that in all three varieties the primary changes begin in the epithelial cells of the organ (that is to say, as an inflammation that is essentially parenchymatous in its nature), and that the same varieties are found at autopsies differing distinctly from each other, both as to their gross and as to their microscopical appearances. The three forms which we may thus recognise are the large white kidney; the haemorrhagic kidney; and the mottled or secondary cirrhotic, or smooth cirrhotic, kidney. Finally, the mode of development and the symptoms presented by these kidneys enable us to foretell accurately what kind of kidneys will be found at the post-mortem.

Morbid Anatomy.

The Large White Kidney.

It is in cases where the acute nephritis has passed into the chronic form, or where the disease is chronic in form from the beginning, that one encounters the large white kidney. It is not a common form of nephritis; and it may sometimes change into the motiled or smooth cirrhotic kidney, owing to the secondary development of connective tissue. With it the patient dies usually within two years of the development of the disease; and at the autopsy the kidneys appear to the naked eye to be enlarged, their surfaces smooth, and their capsules non-adherent. Their colour is generally pale, sometimes yellow or white, and the injected stellate veins cause their surface to be mottled with red points. On cutting into them, the medullary portion appears to be darker than the
The latter is increased in size, of a yellowish white opaque colour, dotted here and there with haemorrhagic and congested portions, with also obliteration of the normal markings. If we now proceed to microscopical examination, haemorrhages are seen within the capsule of Bowman and in the convoluted tubes, sometimes between the latter. The epithelial cells lining most of the tubes will have undergone granular or fatty change. In some cases the cells will be atrophied and the tubes collapsed; in others the epithelium will appear normal. Glomeruli in certain areas will appear shrunken and their capsule thickened by new connective tissue; in others the epithelium of the tuft and the capsule will be altered and desquamated — glomerulo-nephritis. The vessels of the same glomeruli will have given hyaline degeneration; others are fatty and blocked with leucocytes. Connective tissue is increased — not generally throughout the cortex, but in circumscribed patches, especially around the tufts, and the convoluted tubes, in close proximity to the glomeruli. Never is the increase of connective tissue as great as in the mottled or secondary cirrhotic kidney. The renal tubes are filled with granular matter, the remains of broken-down cells; but in some cases they will be found entirely denuded and collapsed, and in other places they will have disappeared to be replaced by new connective tissue. Finally they may contain often hyaline casts and red blood corpuscles.

**THE CHRONIC HYPERTROPHIC KIDNEY.**

This is the rarest of all forms of nephritis, the kidneys appearing to be enlarged, pale, smooth, and hard. When cut into, the cortex seems to be studded with red and brown patches of effused blood. The microscope reveals the presence of extensive haemorrhages in to the capsule of Bowman, in and about the convoluted tubes. The interstitial tissue is infiltrated in many cases with round cells, and areas of beginning cirrhosis are apparent. The epithelium of the uriniferous tubules shows a considerable degree of fatty degeneration. In some tufts the epithelium of the glomeruli is desquamated. Often this kidney presents most of the changes found in the large white kidney, but the extensive haemorrhages make it a characteristic form readily diagnosed at the post-mortem examination, and the symptoms induced by the lesion during life allow also of this being effected.

**THE MOTTLED OR SECONDARY CIRRHOTIC KIDNEY.**

The use of the microscope shows this to the the most common form of kidney in Bright's disease seen at autopsies on subjects of that affection. In common with the degeneration of the renal epithelium, the kidney shows a gradual increase in its connective tissue, and consequent shrinkage. The two changes seem to develop slowly and together; new connective tissue fills the area left by the degeneration of the epithelium and the collapsing tubes. To the naked eye the kidneys appear to be usually a little larger than normal, rarely smaller; the consistency is firm, the colour is reddish and mottled with gray patches, the red places corresponding to the new connective tissue bands extending inwards from the capsule, the gray or yellow areas to the elevated
portions made up of degenerated tubes. The surface is slightly uneven and the capsule in places adherent, but still easily detached. These kidneys are easily distinguished from those of chronic diffuse interstitial nephritis by their large size, the only moderately adherent capsule, the coarseness of the granulations. The appearances on section are more marked. Pale and gray striations are mingled with red ones, the columns of Bertini are prominent and have a mottled appearance, and the medullary portion is darker than the cortex, which latter, again, is enlarged. The stroma between the tubes, under the microscope, is found to be increased by cell infiltration and new connective tissue. The glomeruli are extensively changed; some have capsules thickened by red cell infiltrations which compress the tuft of vessels. With others the capsule is greatly thickened by concentric rings of new fibrous tissue. All the stages of granulo-fatty degeneration - from moderate to complete destruction of the cells - are seen in the epithelium of the glomeruli and tubes. In some glomeruli the capillaries are distinct, in others the epithelium is destroyed in part or entirely. In many tufts the vessels have undergone hyaline degeneration. There is often thickening of the intima in the small arteries, as well as in those of medium size.

OTHER CHANGES.

There is often dilatation of the left ventricle of heart, and considerable hypertrophy of that structure is seldom or never absent. In many cases, and particularly in the mottled or secondary cirrhotic kidney, the walls of the small arteries are thickened.

ETIOLOGY.

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The etiology of chronic parenchymatous nephritis is not always easy to establish. The duration of the disease and any preceding disease must be taken into account. When an acute nephritis has passed beyond eight months, it may be considered as chronic and that the large white kidney has developed. When secondary to an acute nephritis it generally follows pregnancy, or the malarial or scarlatinal form of renal inflammation. Chronic parenchymatous nephritis is generally found between the ages of twenty-five and fifty, seldom if ever in early youth and old age; when seen in children it is always secondary to scarlatinal nephritis. Men are affected more frequently than women. Dickinson reports eighteen cases in three generations of the same family, and Kidd says he had seven cases in three generations of the same stock. Heredity is therefore an important factor in development of this affection. It appears also to have a good deal to do with habitation and occupation, for it is a disease especially of the poorer classes, being very liable to attack those who live in unhealthy and damp houses, who work amid bad hygieni surroundings, and who are exposed to changes in the temperature. Of all influences alcoholism is the most important, for, as a rule, it is the persistent use of alcohol, especially in the form of the malt liquors, that causes it. Thus, the steady,
every-day drinker, who may never be intoxicated, may very readily develop the disease; cases of which, indeed, are very seldom free from an alcoholic history. The disease is commonly observed in malarial subjects, especially when residing in malarial districts. Chronic rheumatism, syphilis, ptuberculosis, and chronic suppurative processes sometimes produce it, and also sometimes chronic endocarditis. Endocarditis and valvular lesions were the excitants in seven out of every hundred of the cases studied by Bamberger.

SYMPTOMS.

The history of the case and the mode of onset serve principally the differentiate the three forms of this disease clinically. Indeed, many persons will, on careful enquiry, be found to have had the disease for years and have overlooked the fact. Once this variety of chronic diffuse nephritis is established, the clinical picture of its different forms is practically the same. The haemorrhagic form being seldom seen, is more interesting from an anatomical than from a clinical standpoint.

THE LARGE WHITE KIDNEY.

This is the form of diffuse nephritis in which the acute inflammation, instead of being recovered from, as it generally is, continues for a number of months, and chronic parenchymatous changes become established. When the scanty, high colored urine of the acute condition gives place to the free urination, often excessive in amount, and the acute symptoms, such as the large amount of albuminuria and dropsy, have subsided, then the history of the chronic process can be said to have begun. The dropsy, albuminuria, and anaemia never disappear, but begin again to develop slowly, and are hard to combat. The pale face and puffy eyes are characteristic. There is oedema of the feet. This form of parenchymatous nephritis is marked by the extensiveness and great tenacity of the oedema. The anaemia is marked. The heart is not hypertrophied. The urine is of high specific gravity, rich in albumin; often twenty grammes are passed daily; and there are characteristic microscopical appearances.

THE CHRONIC HAEMORRHAGIC KIDNEY.

The phenomena of the chronic haemorrhagic kidney are similar to those of the mottled or secondary cirrhotic kidney, next to be described. The haemorrhagic urine and the obstinate dropsy are the characteristic symptoms. The dropsy absolutely refuses to diminish, in spite of the most careful treatment, constant rest and good nourishment, and even if the flow of urine increases up to the normal amount. Rosenstein, Auffrecht, and several other writers affirm that this is an acute haemorrhagic condition engrafted upon the chronic type, and refuse to recognise it as a distinct form of chronic diffuse parenchymatous nephritis.

THE MOTTLED OR SECONDARY CIRRHOTIC KIDNEY.

Chronicity is marked from the very beginning of cases of the mottled or secondary cirrhotic kidney, and they often develop without any symptoms. The patient is
pale, and complains of palpitation of the heart after exertion, headache, fatigue, and shortness of breath. But the first symptom which generally leads the patient to consult the physician is the dropsy, which is generally mild and seen first about the ankles and then on the eyelids. This form of disease can be readily recognised by the intensity of the clinical picture and the extent of the dropsy - varying as it does from a slight amount about the ankles to general anasarca. These cases often, under careful treatment, apparently almost recover, all the subjective symptoms disappearing, but relapses occur at any time, and before some complication carries him off the patient may have his good and bad times for a number of years. Frequently, however, the constant presence of albumin, with generally a few casts and oedema at times, are the only marks that the disease still hangs about him.

Analysis of the Symptoms.

In cases of chronic diffuse parenchymatous nephritis the urine is usually of light colour, cloudy, and foamy, of acid reaction, and with a specific gravity that varies from 1015 to 1040. The amount of albumin is generally large, 1 to 2, and even 5 per cent., being present - 20 grammes or more being passed in the twenty-four hours. More is passed during the day than at night, and after exercise than after rest. The urea is diminished; especially does it decrease before death and uraemic attacks. The nitrogen elimination is irregular. The sediment is usually abundant. Kidneys affected with this form of nephritis require a long time to eliminate certain substances, such as quinine, iodine, potassium, and morphine. Microscopical examination shows granular and large and small hyaline casts, sometimes epithelial and fatty casts; granular and fatty débris and fatty globules; leucocytes, often enlarged and having undergone fatty degeneration; red blood corpuscles, but only when there is an acute exacerbation of the chronic form; and, finally, often fatty degenerated epithelial cells.

In order of importance dropsy comes next to the urinary changes. It affects the skin, especially that of the scrotum and the lower extremities, and also the serous cavities. Sometimes it remains local. It is especially extensive where the nephritis is a complication of malaria or heart disease. It is an obstinate symptom, and, moreover, the one for which the patient usually consults the physician. Experiments made by Biernak have shown that the greater the interference with the excretion of urine the less will be the free hydrochloric acid in the gastric juice, and that the greater the dropsy the greater the amount of albumin in the urine. Dropsy occurs in ninety-nine out of every hundred cases of nephritis of the chronic character. It commences as a puffy, oedematous condition of the eyelids, and in incipient cases is in parallel with the diuresis. The oedema is caused by the hypo-albuminious condition of the blood and the retention of water.

Sufferers from this form of nephritis are very often afflicted with troubles of the stomach and intestines. Frequently - especially towards the end of the disease,
or when for any reason there has been a temporary arrest in the urinary excretion,—there will be noticed dyspepsia, nausea, or vomiting. Apart from this, however, the patient's appetite is generally decreased, the tongue is coated, thirst is distressing, and there is often an uncomfortable feeling in the stomach. The anatomical changes, and those of chronic gastritis, are responsible for the gastric irritation, and not functional alterations in the organ. Sometimes the dyspeptic complications are purely nervous, and very often they are of uraemic origin. The ammoniacal odour of the patient is due to the decomposition of the uric acid in the digestive organs, and on the same the diagnosis can often be made. The activity of the gastric glands is always decreased, and there is a diminution in the amount of hydrochloric acid secreted. The diarrhoeal and dysenteric complications are due to the uraemic changes in the blood; and ulceration of the colon is often seen.

The number of red corpuscles in the blood and the percentage of haemoglobin will be found to be greatly diminished, the former often falling as low as 800,000 to each c.mm. of blood. The leucocytes are somewhat increased, and the specific gravity of the blood diminished. There is a tendency to haemorrhages, and the blood always contains more urea than naturally.

In the secondary cirrhotic kidney especially, the cardiac condition present is that of hypertrophy and dilatation. The longer the renal affection has existed, the more surely may hypertrophy and dilatation be expected; and these symptoms are seldom if ever unaccompanied by slight dilatation of the left ventricle. An anaemic systolic murmur is generally heard over the base of the heart, and there is usually accentuation of the aortic second sound. The alterations in the condition of the pulse are in the direction of an increased tension, with some stiffening of the arteries later on. So far as the cardiac changes are concerned, it is the dilatation, and not the hypertrophy, that constitutes the prominent clinical symptom of this form of inflammation of the kidneys.

Symptoms on the part of the nervous system are apparently less common in this form of nephritis than with any other. When seen, they are due to the action of urea, and the other waste products of the body, upon the nervous mechanism. They are seldom encountered, except during an acute exacerbation or near the close of the case, for the reason that the accumulation goes on so gradually that the system becomes habituated to its presence. Fleischer has shown that many of the symptoms are due to cerebral anaemia and not to uraemia. When they do occur, they are marked by constant nausea, vomiting, headaches, convulsions, coma, stertorous breathing, or Cheyne-Stokes' respiration; in fact, all the clinical phenomena of uraemia. It is as well not to attribute certain symptoms, such as nausea, vomiting, and headaches, always to uraemia until quite sure that there is no other cause.

The majority of the cases that have retinitis have also hypertrophy of the left ventricle. Rosenstein found
this affection present in 21 cases out of 118; Wagner, in 10 cases out of 157; and Leriche, in 8 cases out of 100. It very often happens that the patient presents himself for the treatment of some trouble of his eyes, little suspecting that there is anything wrong with his kidneys. He will complain of indistinctness of vision, specks, or a mist before his eyes. The ophthalmoscope reveals retinitis apoplectica, fatty degeneration of the retina, or neuritis optica. These conditions are often developed to an extreme degree, not only when the disease runs a very chronic course, but even when it is more acute.

In this form of nephritis the patients always suffer considerably from the effects of malnutrition. Loss of muscular energy and mental vigour are early indications of an advancing degeneration. They complain of always feeling tired and incapable of much physical exertion. The distressing symptoms come on, and when the malnutrition begins to affect the heart, walls the end is not far off. But, if the general health of the patient and his resisting powers are maintained at the best standard, gradually the diuresis increases, the colour of the urine becomes lighter, the specific gravity decreases, the quantity of albumin lessens, the cellular elements diminish, the dropsy decreases, the tension of the pulse increases, the second aortic sound increases, the heart beat becomes more powerful, the apex is carried towards the left, the patient gains strength, and the anaemia disappears. In all respects the patient is better, except for occasional headaches which remind him of his disease. With care this favourable condition may last for a long time, even years, until from some indiscretion an acute inflammation is set up in the already crippled kidney; then the life of the patient may be ended by some complication, as pneumonia, or uraemia. Yet even when the case appears hopeless, a second remission occurs with comparatively good health, to be followed by an acute exacerbation. For years the patient may have these ups and downs. The characteristic symptoms of this kind of kidney are the changes in the dropsy and the apparent recoveries.

As regards the complications, it may be specially noted that oedema of the lungs is the cause of more than a third of the deaths, and next to this comes uraemia with complicating inflammation of the serous membranes. In this form of nephritis inflammatory complications, such as pleurisy, pneumonia, pericarditis, and meningitis, are specially liable to occur. Mumps, gangrene of the skin, and oedema of the lungs or epiglottis are also of frequent occurrence. Often the inflammations are subacute in their development. Chronic bronchitis is almost an invariable accompaniment of parenchymatous nephritis, and exists as a chronic catarrh with an abundant expectoration. The more important complications are those that affect the heart and arteries; these are the result of malnutrition, assisted in many cases by the primary cause of the renal disturbance. We have a complication of grave importance, which may lead to rupture, apoplexy, and sudden death, when the cardiac hypertrophy, which is so constant, is associated with changes in the arteries. Regarding the frequency of the complications, Oscar Meier found in 321
cases that there was an affection of the pleura, pericardium, and peritoneum, together, in 3 per cent. of all the cases; that there was an affection of the pleura and pericardium in 7 per cent. The pleura alone was affected in more than 55 per cent., the peritoneum in 31 per cent., and the pericardium in 16 per cent. In 292 cases Frerichs found pneumonia 27 times, pleurisy 35, peritonitis 33, and pericarditis 13. Rosenstein in 114 cases found pneumonia 20 times, pleurisy 19, peritonitis 10, pericarditis 8.

**DIAGNOSIS.**

There is no great difficulty in the diagnosis of the disease itself, but of the stage or variety of the kidney it is almost impossible to tell correctly in some instances. The urinary examination, together with the symptoms of uremia and dropsy, is sufficiently diagnostic of chronic diffuse parenchymatous nephritis. In some cases the fact, as shown by Cayhlarz and Donath, that methylene-blue is retarded in its elimination from the kidneys in nephritis may be of diagnostic value. In deciding which variety of kidney a patient is suffering from, the history of the case is of the utmost importance; but, if this cannot be obtained, it is helpful to bear in mind certain other suggestive facts,—for instance: in the large white kidney, the urine is of the highest specific gravity, contains the largest amount of albumin, and exhibits fatty changes in its microscopical elements; there is oedema, and extensive and tenacious anaemia present; and the heart is not hypertrophied. Again, in the chronic haemorrhagic kidney, the urine contains a large proportion of albumin, and always red blood-corpuscles in large quantity; anaemia is marked; oedema is excessive and obstinate; and the heart is slightly hypertrophied. Finally, in the smooth cirrhotic kidney, the quantity of albumin in the urine varies, casts often disappear, and its specific gravity is lower; the oedema also varies, frequently nearly disappearing; anaemia is not marked; and the heart is hypertrophied, and often dilated.

Chronic diffuse parenchymatous nephritis is distinguished from chronic diffuse interstitial nephritis by the following points of difference: Cardiac hypertrophy and vascular changes are much more marked in interstitial nephritis. A careful examination of repeated specimens of the urine will usually enable a correct diagnosis to be made; for in interstitial nephritis the urine is larger in amount, of lighter colour, and of low specific gravity; the albumin is scanty, and at times disappears; there are also comparatively few cellular elements,—from which it will be seen that this kind of urine is entirely different from that of chronic diffuse parenchymatous nephritis. Furthermore, a careful consideration of the etiology is an important aid.

To differentiate chronic diffuse parenchymatous nephritis from amyloid kidney is often no easy matter, for both conditions may have the same etiology. But, it is worth bearing in mind that in amyloid kidney the liver is enlarged, and there are recurrent attacks of
The prognosis is always bad as regards cure, though in certain cases life may be prolonged; there can be no hope of repair occurring in a kidney where structural alterations have been produced by the parenchymatous nephritis. It appears that the reported cases of recovery have been in children; but if these are followed up, it will be found that, within four or five years of the so-called recovery, the nephritis has been excited again in some way. Unless originating in scarlatina or malaria, the etiology does not affect the prognosis; the longest course appears to be run in gouty and rheumatic subjects. In the cases of apparent recovery, under favourable conditions the extension of the disease may be delayed for years often, as a comparatively large number of tubes are unaffected in the earlier stages if the disease. Such kidneys being weakened, are especially liable to invasion by acute processes; and these cases may die of uraemia quickly, some slight exposure or alcoholic indulgence having provoked the acute attack. One ought to be very careful in giving a favourable prognosis, owing to the risk of the occurrence of serious complications at any time. Of the varieties, the large white kidney is the most unfavourable, next the haemorrhagic form, and lastly the smooth cirrhotic kidney. Sufferers from the latter form usually survive for some three years, though I have known them to live much longer. In all cases the prognosis must be governed by the presence of secondary inflammation; the presence of uraemic symptoms, the degree and tenacity of the dropsy, the quantity of urine passed in the twenty-four hours, and the condition of the heart and general circulation. The natural course of the structural alterations in the kidney in every case of chronic diffuse parenchymatous nephritis is to become more marked and to involve more and more of the kidney. The effect upon the general health of the patient is not in any exact relation to the degree of the renal lesion. Obviously, these two facts render the prognosis of the disease very uncertain. The malady is always a very serious one, and terminates regularly in destroying life; but it is difficult to tell beforehand the length of time that will elapse before the fatal termination, and the precise way in which death will take place.

TREATMENT.

There seems every justification for the common belief that there is no good reason for supposing that we can directly influence the development of the renal lesions, though it is possible that by improving the general health of the patient the development of such lesions may be indirectly delayed. There is also good reason for believing that some of the symptoms which occur regularly in patients who have chronic diffuse
parenchymatous nephritis are not dependent upon the renal inflammation, but on other causes. We may therefore look for indications for treatment in the following directions: In the first place we should arrest, if possible, the degenerative changes which take place in the kidneys, and to the organs and tissues generally restore healthy nutrition. In the second place, we must aim at the prevention of fresh invasion of still healthy renal tissue - by careful regulation of diet, manner of life, and protection from changes of temperature. The first object can generally be accomplished by stimulating the functional activity of those portions of the kidneys which are still healthy. To one who has examined microscopically a large number of kidneys of this form of nephritis is the folly of attempting to restore the inflamed and destroyed renal tissue is apparent; but, by remembering that in the majority of cases the diseased renal tissue at first occurs only in isolated areas, between which are perfectly normal tubes and tufts, then the importance of preserving intact as long as possible these healthy portions is apparent.

Of first importance is the prevention of the chilling of the surface of the body, and the protection of the patient from changes of temperature. His clothing should be such that will not interfere with insensible perspiration, but also keep out the cold. A light flannel shirt should be worn at night; garments of the same material should be worn throughout the entire year, somewhat lighter ones being worn in the summer. Generally speaking, warm climates are to be preferred, but the individual disposition of the patient must always be consulted. He should sleep in a well ventilated apartment, duly protected from draughts, of course. He should be as much as possible in the open air during the day. It is an important matter to watch the function of the skin, and to maintain the same by frequent tepid baths, followed by friction and massage - dry or with oils or fats. It is only when the urine is diminished suddenly in quantity, or when uraemic symptoms are pronounced, that hot air baths can be recommended. In arranging the dietary of the patient it is important to remember that no irritating articles must enter there, and that the amount of proteid should be limited, and carbohydrates made to supply the deficiency. Some authors have dwelt upon the necessity of replacing the albumin lost in the urine. But, in chronic nephritis only a few grains are lost daily, and this is readily compensated for by the ingestion of 250 c.c. of milk or 50 grammes of meat. The limiting of the proteid must not be carried to extremes, and the question decided by the results of practical experience in the disease. The giving of either too little proteid or the same form too often may end in starvation; and, furthermore, every case is a law unto itself, varying with the occupation, the amount of rest, and the stage of the affection. According to Voit (Quoted by Senator), a middle-aged, unemployed man suffering from chronic parenchymatous nephritis would require 85 grammes of proteid; 36 of fat; and 300 of carbohydrates, - the whole giving 1860 calories. This scale, however, in my opinion, contains too
must proteid for an average case; and, with Senator, I
would recommend only 50 to 70 grammes daily, or the
amount contained in from 8 to 10 eggs, in 1/4 to 2 1/4 litres
of milk, or in 250 to 350 grammes of the latter.
As 400 to 500 grammes of carbohydrate, or a correspon-
ding amount of fat — i.e., 100 grammes of fat, 240 grammes
of carbohydrate, equivalent to 2100 calories, or 300 more
than an healthy unemployed man is allowed by Voit. I
understand that in Germany almond milk, or the emulsio
amygdalorum, is largely used. Except in special cases,
alcohol is prohibited. The varous infant and invalid
food may be mixed with the milk, and coffee, tea, or cocoa
may be allowed. The amount of proteid must be cut down to
from 30 to 40 grammes (equivalent to 1 litre of milk,
200 grammes of lean meat, or 6 eggs) in severe cases,
where there are oedema, little albumin, and many casts in
the urine. These figures may be doubled when the con-
dition improves. In many cases excellent results are
obtained by putting the patient, in cases of acute exac-
cerbations, on an absolutely milk diet for one to two
weeks. At least two litres (1 litre being equivalent to
35.2 fluid ounces imperial measure) should be given da-
dily, diluted when necessary, with carbonated water or
lime-water. If there is a tendency to diarrhoea or con-
stipation, of if meteorism occurs, lime-water is to be
preferred. Kumiss and kefir are valuable additions to the
diet, and their use is not contraindicated, as a rule, by
the small amounts of alcohol which they contain. Buttermilk may be substituted for sweet milk when constipa-
tion occurs, or if the patient prefers it. In all cases the
return to ordinary diet must be gradual. Fat, in the form
of cream or butter, may be added. Sugar, fruit syrups,
jellies, and the like, may be given, using especially
apples, pears, or raspberries. Meat may be added in mod-
erate quantities, care being taken to note the effect.
The outer surface of roasts and browned meats must be
avoided. The white meat of chicken os usually recommended
at first, but recent investigations have failed to show
any different results from the use of light and of dark
meats. Carbohydrates in the form of milk, gruels, and cer-
eals, as well as toast, zwieback, and bread not too new,
may be partaken of. Sago and tapioca are valuable addi-
tions, and potatoes may also be allowed. The patient shou-
dl take exercise if he is able, failing which massage
ought to be resorted to. The best forms of exercise are
walking and riding, bicycling perhaps the worst; fatigue
should be avoided, and care be taken at all times not to
catch cold. Except when specially indicated, stimulants
must be forbidden emphatically; and the patient must not
be allowed to smoke, except when he is apparently well.
The marriage state should be forbidden, at least preg-
nancy, for sexual intercourse, according to the best obser-
vers, only helps to increase the symptoms. Men ought to
relinquish their vicious habits, and, if possible, retire
altogether from business, and live year after year in
the most suitable climates.

Of less efficacy than the manner of life, the diet,
and the clothing of the patient, but still of some im-
portance, are the improvement of the clinical conditions
by means of drugs, many of which, especially the fancy ones so largely advertised, are used on more or less empirical grounds. Most of the diuretics promote the flow of the watery elements of the urine rather than favour the excretion of the solids. The extent to which digitalis should be employed will be determined by the amount of urine passed, the quantity of albumin, the character of the casts, and the extent of the oedema. When the urine shows concomitant acute inflammation, then it should be increased; but if the urine is diminished during its use, it should be discontinued. It is important to remember that the best preparation of digitalis to use for its diuretic action is the infusion made from the fresh leaves. The acetate or bitartrate of potash can be added to increase its action. Many cases rapidly improve on the diuretic pill of digitalis, squills, and calomel, due care being taken that the patient does not become salivated thereby. In chronic diffuse parenchymatous nephritis the alkaline mineral waters are of more use than in the acute form of the disease; they have the effect of eliminating the epithelial accumulation in the convoluted tubes. Consequently, lithia water may be drunk freely. Mercury should not be given for any length of time. Formerly mercurials were given extensively in the treatment of this form of nephritis, and their use was persisted in for a considerable period. This plan of treatment has not proved satisfactory, and is now generally abandoned, only being used when the symptoms of an acute exacerbation occur, such as diminishing amount of urine with increased oedema and dropsy. The best results are obtained with small doses, say 1/10 grain, of calomel every half hour until a grain is taken, and this continued for a few days. Iron and cod-liver oil are tonics that form most valuable adjuvants to the diet in the bringing of the nutritive processes to their highest standard; and they can be given for a long period. The former is best given as the tincture of the perchloride, but must be stopped should gastric troubles appear. Other ferruginous preparations have their special advocates. Jaborandi or the hydrochlorate of pilocarpine may be cautiously used in very urgent cases: there can be no doubt about their prompt and efficacious action, but carelessness in their exhibition is a frequent source of danger. In Germany diuretin is extensively used in the treatment of this form of nephritis; but it very often is uncertain in its effect. Certainly it increases the flow of the urine in the majority of cases, but there are very few patients suffering from chronic parenchymatous nephritis that can stand its use for any length of time, owing to the severe gastric disturbances which it produces. Further, its diuretic action seems to be only temporary; the best results are obtained in those cases in which the nephritis is complicated by cardiac insufficiency and weakness. Only when the other means at our disposal have failed to improve the action of the kidneys, and the dropsy is becoming excessive, or the uraemic symptoms are developing rapidly, should the hot air bath, hydrogogue cathartics, and powerful diuretics be employed; for, it is a cardinal rule in the treatment
of this form of nephritis that no depleting measures should be applied unless in cases of great emergency. The hot pack, once a day or once every other day continued for a long time, appears to benefit many cases. A weak heart, or excessive dyspnoea, would contraindicate the use of the hot bath, and it should never be used after the relief of the urgent symptoms. Stimulants independent of food should never be allowed; though their use, in moderate quantities only, after meals will have a good effect upon the dyspeptic symptoms when present. Ale and beer must be forbidden, and the patient advised to confine his attention to strict moderation in his use of well-diluted whisky or light wines.

CHRONIC DUFFUSE INTERSTITIAL

NEPHRITIS.

SYNONYMS.

Chronic Non-exudative Nephritis; Chronic Interstitial Nephritis; Chronic Desquamative Nephritis; The Third State of Bright's Disease; Renal Cirrhosis; Cirrhosis of the Kidney; Contracted Kidney; Granular Kidney; Small Red Kidney; Granular Atrophy of the Kidney; Renal Sclerosis; Primary, or Genuine, Contracted Kidney; Stout Kidney; Chronic Productive Diffuse Nephritis without Exudation.

HISTORY.

The structural alterations in the kidneys, from time to time designated by the above variety of names, has been held to represent the third stage of what is known by authors as Bright's disease, and has been alleged to be the final result of diffuse nephritis. It was supposed that the process was introduced by a stage of hyperaemic swelling, corresponding to the acute parenchymatous nephritis; that it is followed by a stage of infiltration, our chronic parenchymatous nephritis; and that, after the absorption of the infiltration, from this is finally developed the shrinking or contraction of the organ. Bartels affirmed that clinical observation, however, first convinced him that this traditional idea entertained in Germany did not represent the real truth of the matter. When he came attentively to watch and follow the symptoms which marked the whole course of the disease in those cases whose ultimate anatomical issue was the condition known as Bright's disease of
the authors, he found that no symptoms of signs of chronic parenchymatous nephritis opened the chapter of the disease, and that no signs of chronic parenchymatous nephritis appeared as the precursors of the last but characteristic group of clinical features which accompanied progressive contraction of the kidneys, features which Traube has painted with such masterly skill. Indeed, he came to the conclusion that this form of kidney atrophy was the result of a pathological process of its own, and one that began and followed its course quite independently of the process of diffuse renal inflammation previously described. He believed he would be able to adduce anatomical proof that this view, first suggested by clinical observation, is the correct one. At the time of writing, however, he said that he must still leave the question undecided as to whether exceptional cases may not occur where previous parenchymatous inflammation gives the impulse from which this peculiar process of contraction is determined in its development. He goes on to explain the development of his views of the nature of this whole process; and remarks that, so far as this is concerned, the opinions of writers who recognize this affection to be independent of parenchymatous nephritis do not agree, and that especially is this the case of writers in this country.

DEFINITION.

Chronic diffuse interstitial nephritis is a form of inflammation of the kidneys characterized by a new growth of connective tissue in the stroma, resulting in degeneration and atrophy of the parenchyma, and marked vascular and cardiac changes. The essential characteristic of the disease is the fibrous outgrowth referred to, from which the anatomical elements of the kidney are more or less completely destroyed. The disease is, moreover, of slow and insidious development.

CLASSIFICATIONS.

From both the etiological and histological standpoints we can recognize two varieties of kidneys in this form of nephritis, namely, the genuine inflammatory cirrhotic kidney,—an independent primary affection, developing like cirrhosis of the liver,—and the degenerative cirrhotic kidney, which is a sequel to arterial sclerosis. The kidneys of the second class are more common than those of the first; and in both the essential lesion is in the secreting cells first, the connective tissue outgrowth being secondary. Diagnosis between these kidneys (the gross appearances of which I purpose describing together) can only be made by means of a microscopical examination. Several writers have added a third variety of kidneys, namely, those which started as large white kidneys or smooth cirrhotic kidneys, and in
time became contracted into the kidneys of chronic diffuse interstitial nephritis. Experience in post-mortem examinations does not, however, bear this out, and it is now believed by most that all the kidneys of true cirrhosis can be embraced under these two heads.

MORBID ANATOMY.

There is a reduction in size about equal in both kidneys, which often weigh not more than an ounce each. The capsule is thickened and adherent; the surface is irregular and granular; it presents a puckered appearance. The kidneys are either hyperaemic and red, or anaemic and of a pale gray colour; the gray is the more common. The red is the more developed form, is smaller than the gray, the granulations on its surface are larger where also small cysts containing a clear, transparent liquid are frequently to be seen. On cutting open the organ, it will be seen that the cortex is thinned, especially at the site of the cicatrices. It is reduced to a third of its normal size, and has the same colour as the surface. The pyramids are shortened and redder than normal, the pelvis is wider, and there is much fat around the organ. The small arteries stand out prominently. Deposits of urate of soda, which are invariably present when the renal disease is associated with gout, are found as white lines through the medullary substance. The granular elevations are seen with the microscope to correspond to the portions of the cortex which remain; the sunken portions to the atrophied parts which have been replaced by connective tissue. The increase of connective tissue is widely distributed throughout the organ, especially in the cortex between the medullary rays, and more especially about the veins. The first step of the induration change is a round cell infiltration in the interlobular tissue and about the tufts. This tissue becomes fibrillated, contracts, and destroys both tubes and tufts. Areas of small round cells are often seen on the edges of the old fibrous patches, showing that an acute process is going on and that the new connective tissue is forming. The capsules of the glomeruli in the affected areas are thickened and compressed by the concentric rays of new connective tissue which surrounds them. When the new tissue is diffuse the changes in the tufts are most marked, but when the process apparently starts another the vessels it is much less so. The increase of connective tissue seen between the pyramids is more diffuse and less in amount than in the cortex. The glomeruli begin to atrophy; the epithelium in the capillaries to loosen, and that covering the tufts to be desquamated when there is much thickening of the capsule of Bowman and narrowing of the vas afferens. The tufts, which in this form of nephritis are practically all changed, then undergo hyaline degeneration, and each one is converted into a granular nucleated structure.
which does not allow the blood, or artificial injections, to pass through it. There is but slight change, if any, in the capsular epithelium. Some tufts, especially in the areas free from connective tissue, appear normal, but on careful examination it will be found that the cells of these tufts are increased, and also that there is thickening of the capsule of Bowman. Albuminous urine is excreted by the changed tufts, and it not only packs together the degenerated and desquamated epithelium, but carries away the granular débris as it flows down the tubes. Between the capillary loops there is apparently a certain amount of connective tissue, the great increase of nuclei seen being derived either from the white corpuscles within or without the vessels, the desquamated epithelium covering the tufts, the new connective tissue between the loops, or from the endothelium of the capillaries. The changes described under parenchymatous nephritis are those which are seen in connection with the epithelium of the uriniferous tubules. Many of the tubes contain casts and granular débris, but a smaller number than is seen in parenchymatous nephritis. The cells of the tubes in the connective tissue areas are atrophied or replaced by cuboidal cells. Some of the tubes are entirely denuded of epithelium; others are dilated, and the cells appear to have undergone granular fatty changes. Many tubes are greatly dilated, which is due to plugs of granular débris forming in the portions constricted by the new connective tissue, and the pressure of the urine dilating the tubes above the plugged portion. The degeneration of the renal epithelium is much less widespread than in parenchymatous nephritis. Large areas of normal tubes are seen in kidneys in an advanced stage of the disease; and this condition no doubt accounts for the slowness in development of the malady and the prolonged life of patients suffering from this form of nephritis. The lesion seen in the renal vessels is that of an advanced sclerosis of the arteries. The tunica adventitia is thickened; the inner coat shows an inflammatory growth - endarteritis obliterans, which in places almost obliterates the lumen of the vessel. The media is also thickened by an increase of connective tissue which has replaced many of the muscular fibres. The capillaries become obstructed, and finally obliterated. In the second form of nephritis - the degenerate cirrhotic kidney - the changes described above, occurring in the small and medium sized arteries, are characteristic and prominent. They are enough to establish the diagnosis and classify the kidney. By these changes in the small arteries and in the vessels of the glomeruli the circulation through the kidneys is impeded. This leads to degeneration of the renal epithelium, which no longer receives enough blood to nourish it; atrophy occurs, and new connective tissue develops in its place. This is the course of events of the changes in these kidneys, commencing with the arterial one. The primary and characteristic change in the first form - the genuine cirrhotic kidney - is in the glomeruli, the tubular and connective tissue changes being of a secondary character.

Apart from the renal changes just described, there are
others of importance to be found elsewhere. Thus, cardiac changes are never absent. The most prominent is cardiac hypertrophy, and this will always be found if the heart be carefully examined, although in many cases seen at autopsy the secondary dilatation is so pronounced that the hypertrophy may be overlooked. Sometimes the hypertrophy is so excessive as to produce the cor bovinum. Many theories have been advanced to account for this hypertrophy: The mechanical or blood-pressure theory was vaunted by Traube, who explains the hypertrophy by changes in the larger renal capillaries and increase in the fluid elements of the blood, with the result that the heart has too much work to do. Pull and Sutton advance the arterio-capillary-fibrosis theory, affirming that the thickening of the outer and inner coats of the renal arteries, with atrophy of the muscularis, gives a constant obstruction in the renal circulation which only hypertrophy of the heart can overcome. A third theory is that of chemical changes. The urinary excretions, being retained in the general arterial system, cause an irritation resulting in hypertrophy, the work of the heart being added to by a gradual accumulation of material for a long time in the blood. The fourth theory — that of Cohnheim — explains most satisfactorily the hypertrophy of the heart, and is now the one most generally accepted. He believes that when parts of both kidneys have been destroyed by new connective tissue, an increased force of the heart is necessary, with general arterial contraction, to maintain the pressure of blood in the obstructed, but still normal, areas. He also believes that the circulation through the kidney, which is regulated by the contraction or dilatation of the small renal arteries through their muscular coat, depends solely upon the excrementitious matter in the blood requiring urinary excretion; to accomplish which object without disturbance of the general circulation requires increased cardiac action and general arterial contraction. This explains the hypertrophy seen in parenchymatous nephritis as well as in interstitial renal inflammation. Associated with this form of nephritis is found a general arterio-stenosis change, not only in the middle but also in the external and internal coats. Especially in the case of the degenerated cirrhotic kidney, atheromatous and calcareous changes are usually found along the aorta. The reason for the general arterial tension has already been given; and it must also be remembered that it is the dilated and failing, and not the hypertrophied, heart which is to be feared in nephritis. I am of the opinion that the dilatation is due to changes in the muscular fibres of the heart, especially those of the left ventricle, brought about, first, by the blood, loaded with the uraemic poisons which have not been eliminated by the kidneys, failing to properly nourish the myocardium; second, by the coronary arteries obstructed by fibroid changes and furnishing an insufficient quantity of blood to the heart. The hypertrophied heart is constantly pounding against tense arteries, with the result that degeneration of the arteries takes place, and permanent fibroid disease is established — than the condition resulting from sympathetic arterial contraction this one is vastly more serious.
ETIOLOGY.

This is sometimes obscure. We know that chronic diffuse interstitial nephritis occurs most frequently in males and between the ages of forty and sixty. It is almost always to be seen in two classes of cases, that is to say, in those with an hereditied or acquired lithaemic or gouty condition, whose urine always contains an excess of uric acid, the kind of persons who live well, exercise little, and stimulate themselves with alcohol moderately; or it may be seen in those whose arteries tend to degenerate early, in whom the fibroid diathesis is well marked. This latter condition is most commonly inherited, accompanied often by functional weakness of the liver, and by defect in development of the nutritive processes. The cirrhotic kidney is more liable to be developed by excessive eating, especially of meat and rich foods, than by excessive drinking, though it is often produced by the prolonged use of alcohol, especially of the malt liquors. It is a clinical fact that active brain-workers, who exercise little, live well, and drink moderately, are particularly liable to develop this form of nephritis through arterial sclerosis. Alcohol and hard mental work cannot go together without injury to the kidneys. The cirrhotic kidney may be caused by chronic lead-poisoning, but yet is by no means always produced by that condition. Koster found the cirrhotic kidney in only two out of thirty-seven cases examined, and other observers place their findings at from ten to forty per cent. Consequently the one stands in casual relationship to the other much less frequently than is commonly supposed. Gout is apt to be an important etiological factor in this country, but not so much so in others where beer and malt liquors are less consumed. Charcot has proved that gout may exist for a number of years and the kidneys not be affected. The cirrhotic kidney is not an attendant upon acute gout; it is seen most frequently in those who live all their lives just upon the border-line of an acute attack. Less often than gout does rheumatism produce this form of renal inflammation; still, this kidney has developed after severe cases of acute articular rheumatism, and is sometimes seen with chronic rheumatism; but it is difficult to decide which is the true cause as these cases often suffer from chronic valvular disease due to endocarditis. At the autopsies of aged persons the senile kidney is commonly found; and, so far as the gross and microscopic appearances are concerned, it is a cirrhotic kidney. It is not a true nephritis, but only a part of the usual changes of old age; and is due primarily to changes in the renal blood-vessels, just as atheroma is commonly found in the large arteries of old people. The production of a specific disease of the renal arteries is the element in syphilis responsible for the cirrhotic kidney; and interstitial nephritis may also arise from other affections of the genito-urinary passages, such as stricture of the urethra, and pyelitis.
Chronic diffuse interstitial nephritis may have existed for a considerable time, and may have reached a serious degree of development before the patient becomes aware, by any kind of symptom, that his health is no longer as good as it used to be. This fact is attested by the no small number of cases in which the kidneys have been found in an advanced stage of the affection in persons who have died of some intercurrent disease, and who, up to the date of the occurrence of the latter, have carried on their usual avocations without let or hindrance. Many cases, then, are discovered only at post-mortem examinations; for, so long as a sufficient amount of renal tissue remains for the removal of waste products from the body an increase in the amount of urine passed, and the necessity which the patient is under to rise often during the night to pass it may be the only symptoms. But, the effects of the defective elimination will manifest themselves sooner or later. General muscular weakness and an unaccountable lassitude will gradually develop; the patient feels that he is growing old, and is unable to apply himself with accustomed energy to work. There is gradual loss of appetite, and marked dyspeptic symptoms appear early, accompanied by especially in the morning acidity and anorexia. Possibly at this time some slight oedema will be noticed about the ankles, most marked at night and disappearing in the morning. Various evidences of the action of the poison on the nervous centres, such as pressure on the head, headache in the occipital region, and pain in the back of the neck, will preceding or following these gastric symptoms - appear and resist all ordinary treatment; this is especially seen in the case of neurotic persons. The development of interstitial nephritis is also marked by irritability of temper, fretfulness, treacherous memory, and sleeplessness.

**ANALYSIS OF SYMPTOMS.**

The face of the patient is generally pale with a slight yellow hue. He has a weary, listless expression; the eyelids are slightly swollen; the temporal arteries are tortuous; the skin of the body is dingy, dry, and scaly, and there is but little tendency to sweat, and stripes remain when the skin is scratched. The patient is markedly anaemic; the amount of the serum of the blood is increased; the haemoglobin is reduced; and the red blood-corpuscles are also reduced from five millions to three.

Some patients have no oedema at all; it is very variable. When it occurs to any extent it must be regarded as due to a secondary parenchymatous nephritis. Its variability can be shown by the fact that for one or two weeks it may be present about the ankles every night or after long standing or walking, and then be followed by a still longer period in which it is entirely absent.

Loss of appetite and anorexia are the main gastric disturbances complained of at first; later there may develop nausea and vomiting, with profuse diarrhoea. The dyspeptic symptoms are frequently the earliest to attract the patient's attention.
The presence of retinitis is of great importance in diagnosing this form of nephritis; and the yellowish-white spots, with small inflammatory exudates and often minute haemorrhages, should always be searched for on the retina with the ophthalmoscope.

During the course of cirrhotic kidney certain cerebral symptoms may develop, such as disturbance of the motor centres, uremic convulsions, tremors, localised contractions of muscles, especially those of the face and neck, and epileptic convulsions. Hyper- and hypothermia may be produced by the action of the poison on the centre for the regulation of heat; Cheyne-Stokes' respiration if the respiratory centre be attacked; deafness, blindness, and hemiopia when the sensory centres are affected; and when the psychic centre is disturbed delirium, melancholia, hallucinations, vertigo, or coma may appear.

In cases of cirrhotic kidney, the quantity of urine passed is greatly increased, so as often to lead to the suspicion of diabetes. Thus, a patient may pass as much as five to ten pints in the twenty-four hours. It is clear and often of a slightly greenish colour, and there is little or no sediment. The specific gravity is low, varying from 1006 to 1012, and it has an acid reaction. Albumin is generally present, but in small quantities, 0.5 per cent. being the maximum amount. At times albumin may be absent for days or a portion of a day, so that repeated examinations of the urine may be necessary in certain suspected cases with urine of low specific gravity. Casts are never present in large quantities, and when found are usually of the small hyaline variety. Unless an acute attack of nephritis develops, no blood-corpuscles are found, but there may be a few lymph cells. In the beginning a normal amount of urea is eliminated, and may even reach five hundred grains per day, but later it is diminished.

The cardiac phenomena are very characteristic of the cirrhotic kidney. The condition found is that is an hypertrophy, and especially of the left ventricle. Bright records that in one hundred cases there were fifty-two with hypertrophy, thirty-four of which were without valvular lesion and eleven with aortic disease. It was certain that in twenty-two per cent. the nephritic lesion could alone be held responsible for the findings in question. Years in advance the increased arterial tension with its firm pulse, ringing second sound, and forcible apex beat may give warning of the developing hypertrophy and foretell the form of nephritis to be expected. The apex beat will be displaced to the left, and will be more forcible than normal, when hypertrophy is fully developed. There is also an increase of the cardiac dulness to the right and left; and the second aortic sound will be found accentuated on account of the resistance of the blood pressure in the aorta and the arterial sclerosis. Frequently a systolic murmur is heard at the apex, depending upon the beginning of dilatation of the ventricle or upon coincident endocarditis. The first sound is weak on account of the arterial changes and the slight dilatation of the ascending aorta. The condition of the patient is favourable as long as the hypertrophy keeps up, and so
regulates the urinary secrations; but, sooner or later, unless death follows from accidental complications early in the disease, degenerative changes will occur in the heart muscle and dilatation with cardiac insufficiency appears. Then the pulse loses its tension, becomes smaller, more frequent, and a little irregular. Slight physical exercise now affects the patient, and he becomes short of breath and is troubled with palpitation. Palmonary phenomena, such as those of mild or persistent bronchitis or congestion of the lower lobes, or even spots of lobular pneumonia, may now appear. Oedema - first of the lower extremities, and later perhaps becoming generalised - may also further testify to the imperfect cardiac action. In explanation of the almost constant presence of hypertrophy of the heart in this form of nephritis very many opinions have been expressed. A few only, however, are worth quoting: Buhl thinks that the primary change is in the heart muscle itself, that is to say, a myocarditis. Cohnheim says local resistance in the kidney increases the pressure of the blood, and so causes the hypertrophy mechanically. Johnson found excessive thickening of the middle coats of the arterioles resulting from tonic contractions. Full and Sutton found thickening of the outer and inner coats with atrophy of the muscularis. Another theory - and one strengthened by the researches of Israel - is that the urinary secretions, being retained in the blood, cause hypertrophy by irritation. The last theory is that of Traube, who points to the fact that more water is taken in and less excreted for a long time, and that there is increased peripheral resistance from the deranged circulation in the kidneys, by way of a satisfactory explanation of the increase in the amount of work which the heart has to do in cases of cirrhotic kidney.

COURSE OF THE DISEASE.

Chronic diffuse interstitial nephritis may run a comparatively mild course for years, even when fully developed; until finally, the patient suddenly falls into a state of uraemic convulsions and coma, from which he never rallies, under the influence of the strain of accidental disease, or complication, or from gradual exhaustion. A person suffering from this form of nephritis is constantly menaced by the danger of the involvement of the comparatively normal portions of the kidney in an acute inflammatory process from exposure, overwork, or indiscretions. In such cases the urine will suddenly decrease in quantity, the albumin will increase, and marked oedema develop before the uraemic seizure closes the scene.

CLINICAL CLASSIFICATION.

In studying the cirrhotic kidney one is impressed with the fact that clinically very many cases will divide themselves into groups according as the prominent symptoms are confined to a single organ. Four such groups can be recognised in this way. The first group includes the cardiac cases, the symptoms being mainly pertaining to the heart, and apparently the renal cirrhosis, the arterial degeneration, and the resulting cardiac changes develop about the same time. This class of cases includes
at least one-fifth of all the cases of cirrhosis of the
kidneys; they show at autopsy the arterio-sclerotic kid-
neys; and are generally found among persons suffering
from gouty manifestations, and exhibiting a marked fib-
roid diathesis. A second class of cases often presents
phenomena of progressive weakness — symptoms which shou-
ld call attention to the renal organs; and this group of
cases appears to me to be more common than is generally
supposed. The patients, however, are many times treated
throughout the whole course of their illness for nervous
prostration, anaemia, or senile decay, the gradually advan-
cing weakness and exhaustion being the only evidences
of renal changes. The third group is that of the cerebr-
al cases, and includes those persons who suffer almost
solely from symptoms pertaining to the brain, such as
headaches, vertiginous attacks, formation, and perhaps a
paresis of a single limb of short duration. The fourth,
and last, class is that of the gastro-intestinal cases.
In it the symptoms are connected with the stomach and
intestines. There may be attacks of profuse diarrhoea
uncontrolled by any remedy, or persistent nausea and
vomiting.

COMPLICATIONS.
Many of these are symptoms rather than complications.
The most frequent of all appears to be cerebral haemorr-
hage, which is escaped from by very few of the well-marked
cases. It is due to the fact that the cerebral arteries
are early affected with the fibroid changes occurring
throughout the general arterial system; capillary aneurisms
are formed; these rupture from some unusual strain, such
as cerebral hyperaemia or excess in cardiac action. Very
many cases present neuro-retinitis, and also haemorrhages
from mucous and serous surfaces, and sometimes into the
substance of organs, are liable to occur. Oedema of the
glottis is a very common complication; and the same may
be said for such others as inflammations of the serous
membranes, peritonitis, pericarditis, sero-fibrinous pleur-
isy, chronic bronchitis with acute exacerbations, catarr-
hal pneumonia, lobar pneumonia, and emphysema.

DIAGNOSIS.

The diagnosis will depend in great part upon the
physical, chemical, and histological characters of the
urine which I have referred to above, and which need not
be recapitulated. It is especially worth remembering that
the disease develops itself so insidiously that there may
be no striking symptoms at its commencement. Even the
first signs of the disease are of such an indefinite
nature, and may be so different in the different cases,
that they cannot be designated as in any respect char-
acteristic, and in no instance do they point directly to
the kidney as the seat of the disease. Only the probing
to the utmost every symptom of disease, with the intention
of discovering its possible cause, and the examination
of the urine of the patients whenever they persist in remaining poorly, alone will enable one to succeed in recognising this insidious renal affection betimes. Headache and vertigo, of a manifestly congestive nature, attacks of palpitation and difficult breathing, at once direct attention to the heart. Then the diagnosis of renal cirrhosis becomes highly probable if, on physical examination, the organ is found to be enlarged or its impulse excessive, if auscultation shows its sounds to be loud and clear, indicating that the valves are normal, and especially if the diastolic sound over the aortic valves is greatly increased in strength, and the pulse is unusually tense. As stated, however, the examination of the urine alone allows of the establishment of a correct diagnosis. The large quantity of urine which the patient passes each day, its pale colour, its low specific gravity, the small amount of albumin which it contains - all these tokens which, placed besides the hypertrophied heart, render the diagnosis of renal cirrhosis positive. Both the morning and evening urine should be examined for albumin and casts, especially the former, for the reason that it may be absent at certain times. Being found also in other conditions, the mere presence of a trace of albumin is no evidence of this disease. Still, the urinary findings described, and the age, history, habits, and symptoms of the patient will usually overcome all difficulties at first trial encountered in the diagnosis. The very groundwork of the latter, it cannot be too strongly insisted, consists of the regular diurnal examinations of the urine extended over a considerable time, and close attention to the state of the heart.

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PROGNOSIS.

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Grainger Stewart's dictum, that "this is the most hopeless of all the forms of Bright's disease", is unfortunately justified by actual experience in the management of the disease. In no respect can the affection be regarded as curable, and he would be rash who would assert that that renal structures, once destroyed, be the cause of their destruction what it may, ever could be repaired again. Hence, when once the pathological changes which I have described as peculiar to this disease are established, the tendency is for them to advance to the fatal destruction of the organ. Though the prognosis is generally bad, the patient may live for a number of years, most of the time enjoying the pursuits of an active life, say, for a score of years. This is, however, exceptional, as about three to five years would represent, with tolerable accuracy, the average of this form of nephritis. Indeed, it appears to be quite exceptional also to have the fatal termination delayed for even eight or ten years. Uraemic intoxication, which generally appears late in the disease and is often fatal, is a constant source of danger which menaces the patient. Still, even with the
severest symptoms the patient may live for weeks or months - e.g., Cheyne-Stokes' respiration, persistent vomiting, and general anasarca. So long as the heart compensates there are no distressing symptoms, but as soon as it begins to fail weakness, dyspnoea, and dropsy will appear, which are readily amenable to treatment at first, but later increase in spite of the greatest care. The pulse, for indications of a developing anaemia or cardiac complications, should be carefully watched. A very grave symptom lies in the severe oedemas which are sometimes seen late in this form of nephritis, and which point to a failing heart rather than superimposed parenchymatous inflammation of the kidneys.

TREATMENT.

It is evident from a due consideration of the circumstances under which the greater portion of all the cases come under medical attention that the prospect for therapeutic results is a cheerless one. In point of fact, such medical experience as we now possess has furnished us with no means or methods calculated to alter this discouraging view of the matter. Even were we possessed of the means to arrest the process of destruction, the help to be derived from them would be all too late, since too much renal tissue would have been already destroyed for the compensatory measures still in operation to provide permanently against the actual defect of the renal secreting tissue. These very compensatory measures, too, are in themselves departures from the normal condition of affairs which are replete with danger. The increased arterial blood-pressure threatens death by apoplexy, and this the more the longer it has endured; and the constant loss of albumin, associated with the excess of pressure throughout the arterial system must eventually impair the general nutrition by leading to the impoverishment and degeneration of the quality of the blood. In spite, however, of the apparent hopelessness of the case as regards the final outcome, a great deal of good may be done by due attention to general hygienic measures. In order to prevent the sudden and acute inflammations of the kidney which are so fatal, and as this variety of renal lesion is especially susceptible to the reflex effects of chilling the surface of the body, the patient should be always be warmly clad and have flannels kept next to his skin both day and night. The patient will usually derive benefit from a change of residence to a warm, mild, and dry climate. The variability and humidity of temperate climates, particularly during the winter months, aggravate this disease, while, to one who can afford it, a sea-voyage or a sojourn at some eastern, western, or European resort, where the soil is dry and sandy and the climate equable, may be very beneficial. It is very necessary that the patient's skin be kept in as healthy a condition as possible; and the importance of this can be readily appreciated when we
remember that by it is removed nearly as much of the waste products as by the kidneys. For this reason tepid baths taken before retiring are of advantage. These can be given daily or only two or three times a week. By taking the baths at bedtime there is less danger of exposure and of taking cold. They must be given with care; and their effect will be enhanced by friction of the skin. In some cases massage, followed by oily inunctions will be of benefit. The stage of the disease and the condition of the patient will determine the kind and amount of exercise to be indulged in; and its effect upon the heart should be noted before drawing up absolute rules, for the condition of the cardiac mechanism the the important guide in the matter. In the early stages, especially when there is marked hepatic derangement, horseback riding should be prescribed, but it should never be carried to the point of fatigue. An out-of-door life is important, and so is a voyage by sea. In these cases with cardiac involvement, and especially with evidences of cardiac failure, the mildest forms of exercise, such as walking short distances or riding, should be ordered. The dietetic indications in these cases also must not be disregarded. At the onset of the disease the patient should be kept on a milk diet, but this should be abandoned if there is no improvement in his condition after two weeks. As a rule, however, one has to deal with a chronic disease that has lasted and may continue to last for years. As a cure is out of the question, the diet should be arranged so as to give the greatest possible degree of comfort and allow the freest activity compatible with the stage of the disease. All irritating food and drink should be avoided, but the restriction of diet need not be so rigorous as in the forms of acute nephritis. The diet, when the case is hopeless, may be left to the taste of the patient and the ingenuity of the nurse, and all possible done to make the patient's last weeks of life as happy as possible. One ought not to lay too much stress on the amount of albumin in the urine or the solid matters there, as there occur many variations for which the diet is not responsible. Under no circumstances should the patient be allowed any form of alcoholic drink as a beverage; he must be a total abstainer in this respect, and be given to understand that if he uses alcohol he does so at his own risk. There are cases, however, in which alcohol is absolutely necessary. In old alcoholics there may be attacks of weak heart or complete anorexia if the stimulant is withdrawn at once; in these cases it may be allowed in small amounts. Some authorities advise its exhibition even in late cases to prevent attacks of uraemic cardiac asthma. In all cases it is one's duty to forbid the use of spices of all kinds, celery, and possibly asparagus and mushrooms as well. Von Noorden allows a moderate amount of asparagus two or three times a week during the season, but warns against using it in excess. The same observer includes in his list of drugs that are dangerous in this form of nephritis—cantharidin, copaiba, turpentine, salicylic acid, carbonic acid, resorcin, hydroquinon, lead, copper, boric acid, silver and mercury and their salts, iodoform, and tar preparations. In this disease it is well to be cautious in the use
of all drugs, though they are in it eliminated more slowly than in health. Owing to its chronicity, and to the frequent occurrence of intercurrent affections, drugs are apt to be used to a greater extent than in any other disease. Provided no injurious effect is produced upon the heart, tea, coffee, and tobacco may be allowed in small quantities, though, in general, they can with advantage be forbidden. The subjective sensations, the strength and character of the cardiac impulse, and the like phenomena, will guide us in this particular. Except that the so-called high game and all rich meats and complicated dishes are to be avoided, meat may be allowed in as great a variety as possible. Either light or dark meats may be allowed. The amount of proteid to be taken may usually be left largely to the patient. A list of articles of food may be given, and he be permitted to arrange his menu himself in most cases. Von Noorden, averaging a series of cases covering five years' experience, found that for 70 kilos of body weight, the nitrogen ingested in the males was from 13 to 16 gm., and in the females from 11 to 14 gm. If expressed in albumin, men, 81 to 100 gm.; women, 69 to 87 gm. Making allowance for the amount in the faeces, the quantity of albumin taken was for the men 92 to 112 gm., and for the women 80 to 100 gm. Based on these figures he gives an average diet as containing the following, subject to variation according to the patient's condition: Milk, 750 c.c.; 2 eggs; bread and vegetables; meat, men, 215 to 315 gm. weighed raw; women, 155 to 255 gm. weighed raw. It is very necessary to carefully determine the amount of water to be taken. Ordinarily the patients are encouraged to consume water, milk, and diuretic drinks. Von Noorden warns against this practice, arguing that the variations in the percentage of albumin in the urine are valueless in estimating the course of the disease, and that the heart may be very much damaged by the extra work thrown upon it by the use of excessive amounts of water. The fluid absorbed from the intestinal tract must ordinarily be excreted through the kidneys, and this means increased blood-pressure and increased work for the heart. Von Noorden limits the amount of fluid to be taken to about one and one-quarter litres. This includes all kinds of fluid taken. The water taken in the solid food - usually from 500 to 700 c.c. daily - may be disregarded. He admits that the amount the patient usually takes should be determined by two or three days observation, and that this amount be gradually cut down by 250 to 150 c.c. a day until the desired quantity is reached. One day a week the patient is allowed a "drinking day," on which all the water desired is allowed. It is found that the excretion of the solid contents of the urine takes place just as rapidly with this restricted amount of water as before, and that in case the excretion is not quite so good, the one-day-a-week flushing keeps the organism reasonably clean. If there is a failing compensation, the flushing-out should not be resorted to, and if there is appreciable dilatation of the left heart the same caution obtains. In some patients, every two or three months, two or three litres a day are allowed daily for two weeks. In thin patients, if
there is no attendant dyspepsia, the patient's condition may be greatly improved by a diet rich in carbohydrates; but the bad effects of allowing patients who have a tendency towards obesity to consume too much carbohydrate material should be avoided.

So far as medicinal treatment is concerned, none of the drugs recommended have the slightest power to dispel the connective tissue already formed in the kidneys — not even mercury or iodide of potassium; let any one who doubts the accuracy of this statement make the trial, and he is sure to be disappointed. Nevertheless the exhibition of diuretics is to be warmly commended. For this purpose digitalis is not required unless there appear some acute inflammation of the kidney. Treatment can be derived, particularly in those cases of interstitial nephritis which are associated with cirrhosis of the liver, from small doses of calomel given for protracted periods; and in cases where the urine is of high specific gravity, and loaded with uric acid a dose of gray powder and quinine at bedtime for a few nights, and followed by a saline purge in the morning, will show marked beneficial results. I am no advocate of the use of mercury as a routine measure in this disease: when given it should only be administered for a short period at a time, and its action upon the system carefully watched. On the other hand, however, the iodide of potassium may be given for weeks together; and in the treatment of this disease its value is beyond question, being a most potent diuretic, and a stimulant of glandular activity of first rank. It is particularly invaluable in cases of arterial sclerosis. The best results are obtained in cases of acute heart failure from the administration of alcoholic stimulants, such as champagne, brandy, or whisky, and also from camphor. The well-known cardiac tonics are useful in subacute or chronic cardiac weakness; and of these digitalis is the best. When used in combination with strophanthus and nitroglycerine its cardiac tonic action is obtained without an increase in arterial tension. To maintain the nutrition of an hypotrophied heart and delay dilatation as long as possible, a general tonic treatment is essential. Tincture of valerian, nitroglycerine, and the bromide of potassium are drugs which will usually relieve any palpitation of the heart present, and good results can also be obtained from the application of cold compresses over the chest. Nitroglycerine and amyl nitrite will usually afford marked relief in those distressing cases of asthma. Some prefer morphine, but it is always to be given hypodermically. Opium is the only form of anodyne drug that can be commended throughout the disease. In spite of the fact that dropsy is less frequent in this than in any other form of nephritis, anasarca may develop in its later stages. It is often necessary to have recourse to punctures of the skin in this condition, especially of the legs or scrotum. Both the kidneys and the general symptoms are markedly relieved by aspiration, which should not be too long delayed after the failure of cardiac stimulants. The control of the cardiac weakness, and the increasing of the secretion of the skin, intestines and kidneys are the measures most suitable for the relief of uraemia; any cerebral symptoms present, such as certain
Congestive phenomena, being controlled by cold compresses to the head, or leaches to the back of the neck. In fact, the treatment does not differ from that used in other forms of nephritis, except that bleeding in some of these cases gives wonderful results. When one has to treat the gastric disturbances, it is as well to remember that diarrhoea is often a means of excreting the urea, and that by suddenly stopping it uraemia may result. When vomiting is persistent, a few days on peptonised milk or koumiss will usually allay or overcome the patient's distress; and other gastric and intestinal troubles will usually be dispelled by means of hydrochloric acid, the bitters, the alkalies, etc. As general tonics the hypophosphites and cod-liver oil are to be preferred; for, although persons suffering from this disease are nearly always markedly anaemic, it will be found that iron will agree with few. Indeed, in many cases the nervous symptoms are actually aggravated by its use. Of course if it can be borne, it should be given, for it will be found to have a specially beneficial effect in improving the nutrition of the heart.

Finally, in 1898, Edsebohls first proposed the cure of chronic nephritis by the operation of decapsulation, and it appears to have since been advocated by Rose, Ferguson, and Wolff. Edsebohls reported 16 cases thus treated by stripping off, except in 2 cases, one-half of the capsule of the organ. The precise therapeutic value of the operation has still to be determined; and, in my opinion, it would be a somewhat daring method of relieving the advanced debilitated cases.
BIBLIOGRAPHY OF BRIGHT'S DISEASE.


Kühne. Lehrbuch der physiologischen Chemie, 1866, No. 543.


Cotugno. De Ischiade nervosa Commentarius, Vienna, 1770.


Stokvis. Experimental Researches on the Pathogenic Conditions of Albuminurie - Jour. de Méd. de Brux., Vols. 44, 45, 1867.


Senator. Ueber die im Harne vorkommenden Eiweisskörper u.s.w., Thid., Bd. 60, S. 475.


Fischer. Sammlung klin. Vort., No. 27.


Henle. Zeit. f. rationelle Medicin, Bd. 1, S. 68.


Frerichs. Die Brightische Krankheit und deren Behandlung,1851.
Treitz. Prager Vierteljahrschrift,1859,Bd.4,S.143.
Jaksch. Ibid.,Bd.2,S.143.
Oppler. Virchow's Arch.,Bd.21,S.250.
Petroff. Virchow's Arch.,Bd.25,S.91.
Kuhne and Strauch. Centrallbl.f.die med.Wissenschaften,1864,Nos.36,37.
Lecorché. Ibid.,April,1874;Diseases of the Kidneys,1875.
James Gregory. On Diseased States of the Kidneys,connected during Life with Albuminous Urine - Ibid.,1831.
Traves. Ibid.,Dec.,1831.
Subler. Quoted by Jaccoud in some remarks appended by him to his translation of Traves! Clinical Lectures,1863.
Liebermeister. Prager Vierteljahrschrift, Bd. 72, S. 1, et seq.
Reinhardt and Lebuscher. Virchow's Arch., Bd. 2, S. 496.
Hamernik. Die Cholera epidemica, Prag, 1850, S. 125 und 126.
Ponfick. Virchow's Arch., Bd. 50, S. 160.
Koloman Mueller. On the Influence of the Cutaneous Activity on the Secretion of the Urine - An Address delivered before the Medical Section of the Association of German Naturalists and Physicians, at Wiesbaden, in 1873 - Exper. Path. und Pharmakologie, 1873.
Henoch. Berl. klin. Woch., 1873, No. 5 0.
Kussmaul. Untersuch. über den constitutionellen Mercurialismus, etc., Würzburg, 1861, S. 167.
Bardleben. Lehrbuch der Chirurgie und Operationslehre, Berlin, 1870, Bd. 1, S. 263.
Leopold Perl. Virchow's Arch., Bd. 56, p. 305.


B. Orteille. On the Nervous Dyspnoea of Nephritis, etc., Lille, 1879.

H. Persoons. Albuminous Nephritis, etc.; Consideration regarding the Pathology of so-called Uraemic Phenomena in Albuminous Nephritis - Presse Med., 1879, xxxii, 57, 65, 73, 81, 89.

Chambige. Death in Uraemia, etc. - Paris, 1879.


M. Biot. Lyon Medical, 1876, Nos. 50, 51.


C. A. Ewald. Ibid., 1877, lxii, 453.


P. Trawitz and O. Israel. Virchow's Arch., 1879, lxxvii, 315.


Whitelaw. The Lancet, Sept., 1877.


Barr. Arch. of Pediatrics, 1887, p. 525.

Emmett Holt. Ibid., 1887; Primary Neph. of Infancy, Ibid., 1887.

Ralfs. Diseases of the Kidney, 1885.


Bright and Farlow. Guy's Hosp. Reps., S. 2, 1843, i, p. 120.

Copland. A Dictionary of Practical Med., i, Lond., 1872, article "Dropsy".


Rayer. Treatise on Diseases of the Kidneys, Paris, 1838.


Fr. Th. Frerichs. Die Brightische, etc., 1851.


W. Roberts. A Practical Treatise on Urinary and Renal Diseases, London, 1865.


Lecorché and Talamon. Treatise on Albuminuria and Bright's Disease, Paris, 1888.


A. Brault. Arch. gén. de Médec., 1888; and Treatise on Medicine by Charcot, Bouchard, and Brissaud, v, Paris, 1893.

Wells. Transactions of the Society for the Improvement of Medical and Surgical Knowledge, iii, 1852, pp. 16, 194.


Quain. The Lancet, Nov., 1845.
Renard. Vorles. über Kinderkr., 1889.
Pognon. Thèses de Paris, 1889.
Kelsch and Kiener. Arch. de Phys. norm. et path., 1882, Nos. 2 and 3.
Reissner. Diss. Göttingen, 1892.
Mannenberg. Ibid., xviii, p. 233.
J. Pansini. Riforma med., 1895, Nos. 10, 12.
Spronck. Compt. rend., 1889, cix, No. 7.
F. Blum. Virchow's Arch., Vol. cxxvi.
E. Fraenkel and Reiche. Virchow's Arch., cxxxi, p. 141.
Ambrosius. Ibid., cxxxviii, suppl. vol., p. 197.
S. Neberthan. Quoted by Fr. Müller, Münch. med. Woch., 1897, No. 47.
Renault and HortoS. Ibid.
Friedländer. Fortschr. der Med., i, 1883, p. 85.
Langhans. Virchow's Arch., Vols. xxvi and cxxii.
Ribbert. Nephritis and Albuminuria, Bonn, 1881.
Hansemann. Virchow's Arch., cx.
Orth. Lehrb. der path. Anat.
Kleider. Ibid., Vol. xci, 1883.
Cavazzani and Ferrarini. La Clinica Med., 1899, No. 5.
A. Stepler. Wien. klin. Woch., 1900, No. 43.
A. Moskowitz. Orvosi Hetilap, 1900, No. 49.
Hock. Wien. med. Presse, 1895, No. 44.
Jaarsveld and Stokvis. Ibid., 1883, xvi, p. 344.
Fr. Kroneseker. Ibid.
S. E. Henschen. Ueber das Herz bei Nephritis, Jena, 1898.
Schonemann. Die sichere der Scharlachkrankheit, Hannover, 1848.
Simonds and Rumpf. Ibid., lxx, 1894, p. 20.
Gara. Ibid., 1893, Nos. 12, 15.
Vas v. Terray and Gara. Ibid.
Pernice and Scagliosi. Virchow's Arch., cxxxix, 1895.
Doléris. Prog. Méd., 1863.
Blanc. Contribution to the Study of the Pathogeny of Albuminuria, etc., Lyons, 1889.
A. Favor. Virchow's Arch., cxxiv, cxxiv, cxxvii, cxxxix, cxli.
Hergott. Prog. Méd., 1892, No. 27.
Feihling. Ibid., No. 10.
Döderlein. Ibid., 1893, No. 1.
Chambrelet. Sem. Méd., 1892, Nos. 9, 10.


Donkin. The Lancet, 1893, p. 1152.


Nollet. Alimentary Regimen in the Albuminurias, Thèse de Paris, 1885.


Futcher. The Practitioner, July, 1903.


Molenaar. Cited by Rosenstein, loc. cit.


Lütjel. Ibid., xxix, p. 313.

Reubel. Pathogenese der Bleivergiftung, Berlin, 1871.


J. Tyson. A Treatise on Bright's Disease and Diabetes, Philadelphia, 1881, p. 156.

J. Kidd. The Practitioner, 1882, xxix.


Hohenemser. Virchow's Arch., cxlii.

Sabourin. Rev. de Méd., 1884, iv.

Besancon. D'une Néphrite liée à l'aphasie artérielle, Paris, 1889.


Hutchinson and Rainy. Clinical Methods.

Newman. The Lancet, July 9, 1898.


H. R. Schroeder. Ibid., July 18, 1903.

S. West. The Lancet, Jan. 16, 1904.
C. W. Edmunds. Ibid.
Mosaner. Wien. med. Woch., 1903, No. 27.
Lagrain and Guillard. Prog. méd., 1903, No. 44.
B. Reed. Amer. Med., Nov. 28, 1903.
E. Hurry Fenwick. Medical Annual, 1902, p. 376; Ibid. 1906, p. 280 et seq.
Tuffier. Presse Méd., April, 1905.
Hundl. Ibid., April, 1904.


F. Avis. The Gastric Secretion in Bright's Disease - Wien. klin., Oct., 1904.


M. F. Porter. Biliary Obstruction as a Cause of Nephritis - Medical Fortnightly, April 10, 1905.


Le Dentu. The Surgical Treatment of Chronic Nephritis - Presse Méd., 1905, No. 103.


H. Jackson. Diet in Nephritis - Ibid.


C. S. Mieswanger. Static Electricity in Chronic Nephritis: A Recapitulation - Archives of Physiological Therapy, April, 1905.


Page and Dardelin. The Treatment of Nephritis by Pig's Kidneys - Presse Méd., 1905, No. 102.


L. E. Schwarz. Ocular Manifestations of Chronic Nephritis - Ibid.


SUPPLEMENT.

OBSERVATIONS.

Case 1.

The patient, a woman 38 years of age, was in good health until the month of January; her fat and robust appearance being striking. Then she caught cold; her feet became oedematous; she had headache, pain in the back, vomiting; her eyesight was impaired; her urine was increased in amount and passed more frequently. She continued in this condition, and losing all flesh and strength, until June, when she came for treatment. At that time the urine was diminished to 18 ounces in the 24 hours; it contained a considerable amount of albumin and hyaline and granular casts. Her colour was still good. There was a moderate amount of oedema of the feet. After this the urine increased in quantity to 8 ounces daily — specific gravity 1002, albumin diminished. In December, she returned for treatment — with nausea and vomiting, dyspnoea, cough, no dropsy; urine 80 to 100 ounces daily. She had become feeble and anaemic, and there was well-marked hypertrophy of the left ventricle of the heart. She again improved, and was crossed off the list after two weeks. In the following March, she returned. The urine was now scanty, and she was troubled with vomiting, dyspnoea, cough, sleeplessness, slight convulsive movements of the voluntary muscles, no dropsy. By the end of April she was again feeling well, and discontinued treatment. In June, she returned with all the old symptoms and oedema of the legs. On July 20th she had two general convulsions. After this she improved for a time, but in September all the symptoms returned, and she was delirious for a good deal of the time. Urine 40 to 50 ounces daily, specific gravity 1005, moderate amount of albumin, no casts. By the end of September she was again sleepless, had several slight convulsions, and died October 2nd. The history is therefore typical of many of the cases of cirrhotic kidneys.

Case 2.

A man, 30 years of age, of intemperate habits, for one year before his death noticed that his urine was sometimes scanty and high-coloured, sometimes abundant and pale, and that his eyesight was impaired. For four months there was occasional nausea and vomiting. For six weeks there was occasional headache, dyspnoea, and oedema of the feet, the urine more scanty. For nine days before death he passed from one to four ounces of urine daily, specific gravity 1014, albumin 50 per cent., numerous hyaline, granular, and epithelial casts. The man was now feeble and anaemic, had headache, was drowsy, vomited occasionally, had twichings of the muscles of the face; continued drowsy, but with his mental faculties quite clear, so that he was able to transact some business an hour before he died. Death was sudden while lying quietly in bed. The
kidneys weighed 20 ounces, surfaces smooth, cortex thick and white, pyramids large and red. The Malpighian bodies showed a marked increase in size and number of the capsule cells; the cortex-tubes were dilated; in some the epithelium was flattened, in others swollen, granular, and detached; there was cast-matter in some of the tubes, both in the cortex and pyramids; in the pyramid-tubes the epithelium was swollen and detached; there was a very extensive growth of new connective tissue in the cortex, partly in patches and partly diffuse.

Case 3.

Six years before his death, a male person caught cold while bathing. He was 41 years of age. Suffered from dropsy, a febrile movement, prostration, scanty albuminous urine, the same containing numerous casts. After a few weeks all the symptoms disappeared and he returned to business. He continued to enjoy good health for about 18 months; then in the winter the urine became scanty and contained blood, albumin, and numerous casts. General anaemia was rapidly developed. The dropsy lasted for six months, and then disappeared, but the urine from that time always contained varying amounts of albumin and casts. For nearly two years after this time the man continued to feel well, was actively engaged in business, had no dropsy, but the urine still contained casts and albumin. Then the dropsy returned again, and was very considerable. But the appetite and digestion continued good; there was no headache, the patient was intelligent and cheerful. The dropsy, a moderate diarrhoea, and the change in the urine were the only symptoms. In two months the dropsy had again disappeared, and the patient returned to his work. After this time, however, the patient was never as well; a little oedema of the legs was present much of the time; he became gradually more anaemic and feeble, and finally died with marked dropsy and anaemia about six years after the appearance of the nephritic manifestations.

Case 4.

This patient was 40 years of age, came for treatment on October 9th, was a beer-drinker, but denied rheumatism and syphilis. He said that he had been perfectly well until 14 months before; then he had an attack of lobar pneumonia which confined him to the house for four weeks. Since that time he had never felt as well, and had occasional dyspnoea. Nine months ago the dyspnoea became so troublesome that he had to give up work, and he also began to suffer from severe headaches. Three weeks ago the urine became scanty, and dropsy appeared in the legs and scrotum. When seen the patient was large and fat. There was dropsy of the legs and of the scrotum, marked dyspnoea, sibilant rales over both lungs; 10 ounces of urine in 24 hours, specific gravity 1023, albumin 10 per cent., hyaline and epithelial casts. The urine on October 12th was 13 ounces; on October 14th, 42 ounces; on October 16th, 54 ounces. On this last day he had several convulsions, became comatose, and died on the 19th day of the same month. At the autopsy the pia mater was thickened,
and there was an increase of serum beneath it. The heart weighed 14 ounces; the aortic and mitral valves were a little thickened, the walls of the ventricles were unusually hard. In the lungs there were a few old hard military tubercles. The kidneys weighed 16 ounces, surfaces smooth, capsules not adherent, cortex and pyramids of red colour, urates in the pyramids. The cortex-tubes showed marked changes in their epithelium, but of nearly normal appearance were the Malpighian bodies, stroma, and the arteries of the organ.

Case 5.

On December 5th a woman, aged 45, was presented for treatment. Denied rheumatism, syphilis, and intemperance. She had considered herself strong and well until two months before. Then she had a sudden attack of dyspnoea, dizziness, faintness, and cardiac palpitation. After this she was never well, complained of pain about the heart, headache, attacks of dyspnoea, dropsy of the face, hands, and feet. The urine was scanty and dark-coloured. She is now emaciated and anaemic, has moderate oedema of the legs, complains of dyspnoea, headache, and nausea. The heart's action is feeble and irregular, and there is a pre-systolic murmur. On December 10th she vomited blood. On January 5th she had a chill, followed by a temperature of 102° F. On January 5th she became drowsy, then had twitchings of the muscles of the face; became semi-comatose, and died on January 11th. Prior to this the urine varied in amount from 1 to 6 ounces daily; it contained a very large amount of albumin and a few hyaline casts. After death the pia mater looked sodden and finely granular. The walls of its arteries were a little thickened, and there were little clumps of endothelial cells on its outer surface. The mitral valve of the heart was thickened and stenosed. The kidneys were of medium size, their capsules slightly adherent, their surfaces finely nodular, the cortex of normal thickness, red mottled with yellow spots. Most of the Malpighian bodies were normal. The tubes were large and contained much cast-matter. There was an extensive growth of diffuse connective tissue separating the tubes both in the cortex and pyramids.

Case 6.

A labourer, aged 33, had suffered from ague-like attacks for several years, and at one time for as long as six months on end. In the month of June he became drop-sical, and was presented for treatment of his albuminuria towards the end of November of the same year. The diagnosis of chronic parenchymatous nephritis was subsequently confirmed by the autopsy. He died on the 7th of January from pneumonia and oedema of the glottis, prior to which the quantity of urine passed was very small.

Case 7.

A boy, aged 13, suffering from general dropsy. This began on the 1st of June without any disturbance of the general health, and was, so far as was known, entirely unprovoked. Up to his death, which occurred on August 25th, during uraemic convulsions, he passed, on an average, estimated from 65 measurements, only 10 ounces of urine.
daily, in which, to the last, a variable, but enormous, quantity of albumin was contained.

Case 8.
A professional musician, aged 48, who was living in comfortable circumstances, was attacked by erysipelas of the face and scalp. On September 25th, he became insensible, and died two days later. Up to the date of his erysipelas, he had reckoned himself quite well, and was deemed healthy by his family and friends, for he had always been capable of following his employment. It was discovered, however, that for many years he had been in the habit of consuming not less than 10 pints a day, sometimes more, of strong ale. His kidneys were found cirrhotic in an extreme degree, and there was considerable hypertrophy of the left ventricle, but no trace of dropsy or other lesion.

Case 9.
A tradesman, aged 50, had apparently enjoyed perfect health, in spite of his very busy life, long journeys, and late nights. There was only one thing which troubled him, and that was his tendency to obesity. He was strictly temperate in his habits, though he consumed tea to the extent of ten large cups sometimes at night. He had frequent micturition in consequence. During the last summer of his life he felt very poorly, repeated attacks of vertigo being the commencement of his troubles. Soon he had attacks of asthma. But it was not until the beginning of December that his ankles began to swell. This induced him, for the first time, to submit to medical examination, when the condition presented was that of albuminuria and great hypertrophy of the heart, and marked weakness of that organ. He died on the 5th day of February. At the autopsy there were found dropsy in large amount, cirrhosis of the kidneys, amyloid degeneration of the spleen, considerable hypertrophy of the left ventricle, and softness of the myocardium.

Case 10.
A carpenter fell down unconscious whilst at work, and died a few hours afterwards. Apoplectic effusion of blood in to the right hemisphere of the brain, hypertrophy of the left heart, and cirrhotic kidneys were found.

Case 11.
A child, aged 8, came under treatment for headache, drowsiness, and obstinate vomiting. The illness had commenced with convulsions, without pyrexia. The urine, normal at the examination at the onset, had for several days contained a large quantity of albumin and was pale and watery-looking. Latterly there had been some bleeding from the gums and the face had become puffy, but this was hardly appreciable to a stranger, and there was no trace of dropsy elsewhere. There was excessive anaemia, and the urine was full of albumin. These and the vomiting were the only symptoms, and it seemed possible that the albuminuria might have some obscure cause in the anaemia, or even some other blood-condition, such as diphtheria.
might supply us with an example of. The child died at the end of six weeks, the vomiting having continued, and intermittent suppression closing the scene. The kidneys were the only organs diseased: they were of natural size. The capsules were adherent; the surfaces slightly dimpled; in color pale fawn, and mottled. They had all the appearance of extensive parenchymatous nephritis of some week's duration, if not some months; and by the microscope the excess of fibrin between the tubes pointed to the existence of a rather advanced interstitial change, when taken in conjunction with the thickening of the vessels and the wasting of the tubes.

Case 12.

This patient, a boy of 6 years of age, was said to have been brought up by hand on milk and oatmeal; when the bottle was given up he developed an intense thirst, which had never subsided, and for which he would drink as much as a quart of water during the night, and in times past even more than this. In early life he would have an occasional attack of sickness after excitement, but was considered healthy until the age of 3 years, when he had a sudden and severe attack of fever and vomiting, thought by one medical man to be a cerebral inflammation, and by another of gastric origin. After his recovery he had suffered from night-terrors, and ever since had been subject to severe attacks of tetany and periodical attacks of vomiting. His urine had been examined from time to time, and it was always of low specific gravity; it sometimes contained albumin, sometimes not, and never more than 1/22nd part. He had not had scarlatina or measles. At the time of examination he was seen to be a wizened-looking child weighing 31½ pounds, with a dry skin and eczematous patches about the face. The parents evidently had great difficulty about his diet, but there was no indication of any disease, except that the urine had a specific gravity of 1005 and contained a good deal of albumin. There were no casts. There was no trace of dropsy. From that time until his death the albumin sometimes disappeared, the polyuria persisting until a short time before the fatal issue. But the peculiarity about the case was that almost punctually once a month he had a relapse, the tetany reappearing, the urine becoming scanty, and so full of albumin as to be nearly solid; the attack would then pass off, the albumin disappearing rapidly down to none, or a mere trace. He died in one of these attacks, comatose, and in state of opisthontos. At the autopsy, the renal surfaces were pale and speckled with fatty products, the cortex much diminished in thickness, the pelves a little dilated. Their structure was much diseased; a large excess of fibrin permeated and spoiled the cortex, and many of the Malpighian tufts were shrunken and in a state of hyaline degeneration. The vessels were thick, but this was not a remarkable feature of the case. The heart was large, flabby, and widely dilated. No disease of the other viscera was found. The brain was in a normal condition. Casts of fat and about 1/6th albumin found in the urine in the bladder.
Case 13.

A girl, aged 8 years, died the day after being first seen. Her previous history was that she had always been easily upset by food, and would then be sick and feverish, with abdominal pain, for a few days. One of these attacks, apparently, commenced 7 days before her death, when she was quite well. She felt sick, had stomach-ache, and was feverish. She afterwards vomited repeatedly, and when seen, on the sixth day, she was in a very alarming condition. She was pale, drowsy, ashy in appearance, with subnormal temperature, cold extremities, and imperceptible pulse. The heart sounds were rapid and irregular. She passed an ounce of urine soon after being examined, of 1030 specific gravity, and containing casts and 1/10th albumin. She passed no urine for many hours, and just before her death became comatose. The heart was large and the left ventricle dilated. The renal microscopical changes were not pronounced; the vessels of the cortex were full of blood, and there were fibrinous casts in many of the tubes. The kidneys themselves had the appearance of a chronic congestion and felt hard; the capsules just a trifle adherent.

Case 14.

On October 4th, a boy, aged 3½ years, had the history that 4 months previously he had an attack of fever; he was hot and thirsty, but had no rash out, and about this time it was also noticed that his urine was scanty and as dark in colour as ale. It had occasionally been of the same colour since. He had been for five weeks in bed with swelling of the legs, etc., which gradually developed. His condition on examination was that of a severe anasarca, no part of the body being free. The impulse of the hear was in the fifth space, just internal to the nipple-line, and the action was rather irregular, there being a half-pause every third or fourth beat. The sounds were flappy and the second reduplicated over the pulmonary area. The urine had a specific gravity of 1010, and contained 1/3rd albumin, with granular and hyaline casts. From October 4th to June 10th he remained much about the same, and on the latter date the albumin measured as much still as a sixth after settlement. It had averaged throughout from a third to a sixth, and there had been several temporary drops. To this it must be added that the child was hardly to be called ill for the greater part of the time, although in this matter, too, he varied, being sometimes very poorly for a day or two and then causing some anxiety. Towards the end of February the dropsy began to diminish, and soon all disappeared. In April the specific gravity of the urine rose from 1010 or 1015 to 1025-1030; it was habitually scanty in quantity, hardly ever more than 7 or 8 ounces. On June 10th the albumin was 1/6th, next day it had gone to 1/24th, and within 4 or 5 days there was none. A trace remained afterwards for six weeks, when he passed from notice as cured.

Case 15.

A boy, aged 4½ years, had been ill with dropsy only
a week, and for the same time the urine had been only a few ounces in the 24 hours. He was very short-breathed, with extensive general anasarca; the urine 1026, full of albumin, and contained large numbers of hyaline and granular casts. The heart-sounds were thick and long, and the second accentuated. He was treated by the wet pack, and by citrate of potassium, in 7-grain doses given every 4 hours, his diet being restricted to milk and water, jelly, biscuit, and bread and butter. The albumin decreased somewhat under these measures, but it remained in fair quantity for 4 months, the specific gravity being from 1012 to 1015, and the dropsy disappeared, but the health of the patient remained at a very low ebb. At the end of this time the specific gravity rose suddenly to 1020, and the albumin disappeared altogether within a few days, and since this he seems to have allied nothing.

Case 16.
A girl, aged 10, had suffered from rickets and deformity of the legs. She had never been a strong child, and her legs had been crooked ever since she began to walk. Nothing peculiar had been noticed about her, except that during the last 2 years she had suffered a good deal from thirst, getting up once usually in the night to pass water. Recently she had had headaches, and laboured breathing and coma on the last two or three days. She was a small girl, with deformed tibiae, and when in bed it was noticed that she had urgent dyspnoea. Respiration 26, pulse 110, temperature subnormal. She was much distressed and somewhat cyanosed, but without apparent cause. Respiration 36, pulse 120. The urine was passed under her and none could be obtained for examination. During the night sharp diarrhoea came on, she became unconscious, moist râles appeared in the lungs, and the day after being first seen she died in a convulsion. At the post-mortem, the lungs gorged, but otherwise normal. Heart: left ventricle wall somewhat thickened, the kidneys were very small, almost exactly the same size, 1 8/9ths inches in length, and 1 1/2 inches broad. They were firm and pale; the capsule stripped with difficulty, tearing away pieces of the cortex; surface of the cortex granular; its section so wasted that hardly any remained, fatty-looking and mottled. The kidney section under the microscope formed a striking specimen of acute interstitial nephritis.

Case 17.
A girl, aged 12 years had an imperfect family history, though it was certain that she never had suffered from scarlet fever; her ailment dated back only three weeks. Her face began to swell and her breath became short. She was in much distress, with dilating alae nasi. Pulse 120, weak; respiration 44; temperature 99.4°F. The resonance at the left base was impaired, and coarse râles were heard throughout both lungs. The first sound of the heart was weak, the second accentuated; no bruit; apex beat in the fifth space put aside the line of the left nipple. The urine was pale, clear; no deposit; specific gravity 1015; one-half albumin. She was treated by hot packs and diaphoretics, and passed gradually-increasing quantities
of urine; but the quantity of albumin remained the
same and the oedema also; there were no casts, and she
died slowly. At the autopsy: much oedema of the subcuta-
aneous tissues. Right lung: 20 ounces of fluid in the
pleura, the lung semi-collapsed and oedematous. The left
lung was gorged and oedematous. The heart weighed 8½
ounces. Wall of right auricle very thin; right ventricle
also, and cavity dilated. The left ventricle very thick;
cavity slightly dilated. Peritoneum contained much fluid.
Kidneys: right, 2½ ounces in weight; left 1½ of an ounce.
Right, small granular on surface; capsule thickened and
adherent; cortex very narrow, hardly existing in places;
pale, infiltrated with urates; ureters and calyces dilat-
ed. Left, very small, merely a vestige; ureter and calyces
dilated; very little kidney substance; capsules adherent;
surface granular; cortex and pyramids infiltrated with
urates; both ureters dilated; no obstruction detected.
Microscopically there was a great increase of fibroid
tissue between the tubules, in many places infiltrated
with leucocytes; the Malpighian corpuscles surrounded
by fibroid tissue, some of the glomeruli having under-
gone a hyaline degeneration, with urates also filling
and dilating the tubules.

Case 18.
A girl, aged 18 years, had had scarlatina 6 years
before, followed by a swelling of the feet. From this
time there is a gap in her history until 6 or 7 months
before examination. Since then she has had sickness and
shortness of breath. Her legs and face had been swollen
for a month only. She was very ill. There was some oedema
of the legs, and to a less extent, of the abdominal wall
also. The urine had a specific gravity of 1010, and was
very albuminous. Death occurred within a day or two, and
upon making the autopsy the kidneys were so much con-
tracted as to weigh 3½ ounces only. Their surfaces were red
and sandy or minutely granular in some parts, bossy and
fatty-looking in others. On the whole they were fawn-
coloured. The wasting was more extreme in one: it weighed
only ½ to ⅔ of an ounce. The heart weighed 10½ ounces,
the left ventricle, although not thick, was remarkably
tough.

Case 19.
Chronic Interstitial Nephritis. - Patient was a woman
of 34 years, who had suffered from double inguinal hernia,
and it while the advisability of an operation was being
considered that albuminurie was discovered. Previous
History. - Pleurisy 7 years ago, and carbuncle on neck
some years after this. Also influenza and inflammation of
the bowels, and frequent bronchitic attacks. Family
History. - Father died of "dropsy." Mother living and
well, but for the fits which she is subject to. Present
Illness. - Patient was confined 3 months ago. She lost a
good deal of blood, and was laid up for three months in
consequence. She suffered from severe headaches, and she
also noticed that the lower part of her legs swelled,
and that here eyelids were puffy. She did not notice the
appearance of her urine. She had been rather short of breath ever since, and now has pains in the back and perspires very freely. On Examination, Patient is thin. No oedema anywhere. Heart's impulse is in the nipple-line in the fifth interspace, and the first sound is louder than normal. The second sound is accentuated and reduplicated. There is no bruit. Lungs.- Show some slight emphysema. Urine.- Specific gravity 1021, acid. Slight trace of albumin, no blood, no sugar; passed in ordinary amount. One Month Later.- There is still the same amount of albumin, and the patient passes more water than heretofore, due to the fact that she was put on a mixture containing potassium citrate (gr. xx.), potassium acetate (gr. xx.), nitrous ether (m. x.), in the tablespoonful of water, given three times a day. Result.- Decided improvement, and no need to operate.

Case 20.

W. H. F., aged 35, first seen on March 9th, suffering from swelling of both legs, and had been so for the last three weeks. Previous Illnesses.- Six years ago had a similar attack to this. Had a severe sore-throat when 13 years of age. Family History.- Nothing of importance. Social History.- Always temperate. Present Illness.- Three weeks ago he noticed some swelling of the ankles at night after a day's work. He had pains in the back and felt cold. He had been working in a draught, but had relinquished his occupation since, though he was able to go about. His abdomen, eyelids, etc., swelled up also, but his feet have been more swollen than when he first took ill. He passes more water than usual, and lately he has had to get up at night to do so. He has never noticed his urine clouded. State on Examination.- There is no puffiness about the face, but the lower eyelids are puffy and the ankles oedematous. Pulse.- Rate 64 per minute, and of high tension, but it is quite regular in force and time. The vessel-wall is distinctly atheromatous for a man of 35. Heart.- The left ventricle is hypertrophied, the apex beat being a little outside the nipple-line in the 5th interspace; and the beat is abnormally strong, being of a thumping character. The first sound is booming, but the second sound is also very loud and reduplicated. Lungs.- Normal. No fluid in pleura. Urine.- Specific gravity 1020, acid. Passes more than normal amount of pale water. There is 6 per cent. of albumin, a trace of blood, with the oxidising test and with the microscope. There is no deposit and no casts. Subsequently albumin dropped to 3½ per cent, and in six weeks to 3 per cent., at which it remained.

Case 21.

Chronic Nephritis. George Baker, on August 6th, complained of cough and swelling of the legs. Previous History.- Scarlet fever when a child. No other illness. Family History.- Nothing of note. Present Condition and Illness.- Four months ago, patient had a severe cough with copious expectoration. He vomited frequently. He passed much less urine at this time. He also passed about a pint of blood per rectum - apparently from
imternal piles. He had very profuse diarrhoea after this. About eight weeks ago his abdomen began to swell, and then his legs and scrotum became swollen. Seven weeks ago his left knee began to swell, was very painful, and has remained so ever since. On Examination.—Patient is a flabby man of more than ordinary size. His face is pale and bloated. There is swelling, and pitting of both ankles, and the left knee-joint is enlarged, tender, and fluctuating. Heart.—Hypertrophied and dilated, but the sounds are normal with the exception of a reduplication of the second one. Pulse.—That of high tension and small in volume, but regular in force and time. Lungs.—Signs of chronic bronchitis, but no tubercle bacilli in the sputum. Urine.—Passes 26 ounces on an average. Very large amount of albumin. No deposit. No casts. Reaction acid. Specific gravity 1010. Other systems normal. Patient was put on a diet of milk, etc., and in about two months his urine had risen up to 45 ounces, and the albumin was less than before. There was also a marked improvement in the cough.

Case 22.
Alfred Mitchell, aged 34 years. Iron moulder. First seen September 14th. Suffering from subacute nephritis, with swelling of the penis and scrotum. Previous History.—Scarlet fever when a boy. No other illness since. Family History.—Parents, brothers, and sisters all alive and quite healthy. History of Present Illness.—A fortnight ago noticed swelling of the penis and scrotum, which gradually increased. Two days ago the legs also swelled. He has noticed several times during the last few months that his eyes have been puffy in the morning. He has been passing less water lately. His work has necessitated his kneeling in damp sand frequently. On Examination.—The patient is a well-built man. His eyelids are puffy and he is pale. Heart.—No hypertrophy and no dilatation or displacement. No abnormal sounds. Lungs.—Healthy. Abdomen.—Distended with gas and fat. There is some tenderness over the kidney on pressing in the left side. Back.—There is oedema over the sacrum. Penis and Scrotum.—Very oedematous. Legs.—Slightly pitting over the ankles. Urine.—Clear, acid; specific gravity 1018. Large amount of albumin—4 per cent. Little blood; no casts. Passes 30 ounces. Subsequent History.—The albumin increased to 7 per cent., even under special dieting; and the amount of blood in it likewise increased. Urine fell to 24 ounces. Urea diminished, and the patient was given hot baths once a week. He gradually improved, and in three months was passing 60 ounces, and the albumin was then reduced to 2 per cent. Patient suffered very much from headache and sleeplessness. Some tube-casts were passed, while the blood remained. He vomited occasionally also.

Case 23.
Subacute Nephritis. John Webber, aged 48, complains of cough, shortness of breath, and swelling of the face and legs. Previous History.—Has had pneumonia twice, last time 4 years ago; no syphilis; no alcoholism.
Family History. - Father died of bronchitis middle-aged, and mother in old age, but brothers and sisters alive and well. Present Illness. - Six weeks ago he had an accident to his foot which necessitated his going to bed. While in bed he noticed that his feet began to swell, and that the swelling gradually extended up the legs. His face became puffy. Shortness of breath developed, and cough, together with blood-stained mucous expectoration. He has not noticed any diminution in the amount of urine. He has not much headache, but both his hearing and sight have been defective lately. He has no pain over the kidney. He has psoriasis. On Examination. - Temperature 100° F. Face puffy. General anasarca of legs and abdomen. Extensor aspects of limbs have patches very like the cutaneous manifestations of secondary syphilis, and are covered with silvery scales. Lungs. - Bases dull, and not much air entering. Vocal fremitus and vocal resonance diminished. Apices show rather prolonged expiration. Moist rales all over the chest. Expectoration thick and blood-stained. Heart. - Left ventricle extends into nipple-line, and the apex is 1 inch pushed out of place. Irregular in force and time. Liver and Spleen. - Normal. Abdomen. - Dulness of both flanks, which became resonant on change of position. Urine. - Acid; specific gravity 1025; albumin; no blood; urates; passes about 25 ounces. Progress and Treatment. - Southey's tubes were inserted into the legs, with the result that a large amount of fluid (about 100 ounces per diem) exuded. After a week they were removed, the legs having become much smaller. The left foot and leg began to be gangrenous, and the patient's general condition weaker. His heart became more and more irregular, and he died three weeks after being first seen. The treatment consisted of a diet of milk, beef-tea, etc. He was allowed 4 ounces of whisky per diem, and was given tincture of digitalis, in 5-minim doses, combined with the iodide of potassium, - 3-grain doses. His cough remained very troublesome throughout, and he coughed up a prune-juicy material.

Case 24.

W. W., aged 39 years, complains of weakness, swelling of the face, hands, and feet; and appears to have been so afflicted for about a week. Previous Illnesses. - Blood-poisoning, about 14 years ago, from a septic finger. Other unimportant maladies. Present Condition. - About a week ago the patient noticed that his hands, feet, and face were swollen, that of the face being noticed first. He has been aware of the fact for some years past that he only passes a little water, and that sometimes also he has experienced considerable difficulty in so doing. He never suffered from shortness of breath or headache. On Examination. - Heart. - Apex in fifth interspace in the nipple-line. There is a systolic murmur at the mitral, heard all over the cardiac area, and propagated as usual. Accentuation of the second sound. Lungs. - Healthy. Urine. - 80 ounces; specific gravity 1025; 0.4 per cent. albumin; slight amount of blood. Pulse. - High tension, otherwise normal. Arteries healthy. Treatment. - Patient was placed upon a milk diet; and in a fortnight the
puffiness had quite gone; there was no blood in the urine, and only a faint trace of albumin there.

Case 25.

Chronic Nephritis and Uraemia. Mrs. M. F., aged 36, an housewife, was first seen whilst in a fit. History.- Her friends stated that the patient was confined three months ago, and that a few days later she began to pass much less water than formerly. The fits now commenced, and were frequent, and of a decidedly convulsive nature. Past Illnesses.- Three confinements,- first one four years ago, after each of which she had convulsive attacks. On Examination.- Temperature 99°F. Patient unconscious and in a convulsive state. The pupils are dilated and react to light. Foaming at the mouth. Passes motions involuntarily. Heart.- Apex beat in the fifth interspace, one inch outside the nipple-line. Mammæ.- Very prominent, with very gorged veins running over them. Lungs.- A few râles at both bases. Some œdema of the sacrum, feet, and legs, but a very marked dusky, puffy condition of the face. Urine.- Passed involuntarily in bed; acid; specific gravity 1020; boils solid with albumin, but has no blood. Course and Treatment.- Patient had a fit about every two days, the chief characteristics of which were the rapid twichings of all the muscles of the body and face. She passed very little water, sometimes only 3 ounces in the twenty-four hours that could be measured, but her bowels were kept lax and watery with drachm doses of the compound jalap powder, frequently administered. The dietary comprised barley-water, weak tea, and milk. The mixture given was one of the acetate of potassium (gr. xx.), the bicarbonate of potash (gr. xxx.), the liquor of the acetate of ammonium (m. xxx.), the bromide of potassium, with the like preparations of sodium and ammonium (aa. 3ii.), in the tablespoonful of water. In spite of all this, she died three weeks after being first seen.

Case 26.

Chronic Nephritis with Double Optic Neuritis. M. J., female domestic servant, aged 17, complains of blindness of both eyes. She appeared to have been blind a month, but has suffered from failing sight for four months. Family History.- Mother died of child-birth. Rest of family and near relatives healthy. Previous Illnesses.- None. Present Illness.- About a month ago patient became suddenly unconscious, and remained so for about three days. Her father says she was "shaking and quite stiff." When the fit came on she happened to be reclining upon a couch, as she was feeling very cold. When she recovered she was quite blind. Her eyesight had been anything but satisfactory for three months before this; and, except for some sickness and headache, she had otherwise been quite well. On Examination.- Healthy-looking, well-developed girl. No signs of puffiness. The pupils are widely dilated, but quite clear. She had not had any mydriatic applied. She cannot see anything. She says that her ankles have been swollen, but that they are quite free from enlargement now. Light has no effect in making the pupils contract, and when she tries to accommodate them
for distance there is no change. She has been sick now and then for some months, and had had no feeling of nausea before these attacks. She has had headaches for some months also, their whole force appearing to have fallen upon the temporal-sphenoidal region on the right side. She has not noticed any change in the amount of urine passed. She has had some pain in her back for two months. She has an acne rash on her chest, as she has been taking bromides. Nervous System.- There is nothing abnormal in any of her motor or sensory functions, except the condition of the eyes. Eyes.- These show marked optic neuritis on both sides, and there is also a patch of macular degeneration on both retinae. Diagnosis.- Double optic neuritis. Urine.- Specific gravity 1012; very pale; only a trace of albumin, microscope shows a few epithelial cells and blood-corpuscles. Heart.- Slightly hypertrophied, and the first sound very loud and booming. Accentuation of the second sound in all areas. No Murmur. Other systems normal. Course and Treatment.- Patient had several fits lasting for a few minutes at a time, and at intervals of about a week. She felt quite well before and after them, she had a good deal of earache also. Occasionally she had fits lasting some hours. Her pulse remained of low tension throughout, and she had no stertorous breathing. She remains in a semi-delirious and muttering state for some hours. After a month ot two patient complained of great pain at the back of the head and neck, and sometimes of feeling giddy. She got rid of all her headaches and sickness in a few months, but the neuritis is complete. The urea averaged 5 grains to the ounce of urine, and the urine itself about 30 ounces daily. But she passed a large amount of urine when the bowels acted. The treatment adopted was such as described in the preceding text.

Case 27.

Acute Nephritis. William Keast, aged 36, first seen on November 5th, died November 13th. He complained of general swelling of the legs and body, of four weeks' duration. Family History.- Father, mother, brothers, and sisters all alive and healthy. Personal Vices.- Up to ten years ago drank beer and whisky very freely. No history of syphilis. Total abstainer for past ten years. Previous Illnesses.- Had rheumatic fever when 20 years old. After a heavy drinking bout, 12 years ago, he had an attack something like the present one. Had scarlet fever at the age of 21. He has always felt the cold weather very much. Present Illness.- Four weeks ago his ankles began to swell, and his eyelids were full of blood. His legs and abdomen quickly became swollen, and his face very pale and pasty. His water was very scanty, and he affirms that it was quite red a fortnight ago. He has never had a fit of any kind, but has experienced a great deal of pain in the small of the back. On Examination.- A well-developed, healthy man. He is pale, and looks ill. His face is puffy and swollen, and his breathing is rather difficult. There is oedema of his ankles, scrotum, and sacrum, as well as fluid in his abdomen - in an amount sufficient to cause a considerable distension. His breath is rather uriniferous, and his skin dry and hot. He has
a slight discharge of pus from the left ear, which came on a week ago from no known cause. Urine.—Acid; small quantity; specific gravity 1022; white deposit; contains a large amount of albumin and blood. Microscopically—This deposit is made up of an enormous amount of blood and epithelial casts, as well as free blood-corpuscles.

Heart.—Apex beat seen, and felt, just below the nipple in the fifth interspace. There is a systolic murmur heard best in the aortic area. The first sound in the mitral area is very loud, just as if the ventricles were very muscular. Arteries.—The carotids can easily be seen pulsating in the neck. Pulse.—Regular in force and time—about 100 per minute; tension high; volume small; slight atheroma. Respiratory System.—Dullness on percussion at both bases—rather more extensive on left side. Vocal fremitus and vocal resonance diminished over the dull area; otherwise healthy. Respiration about 26 per minute.

Treatment and Course.—The patient was put on a milk diet, and given tincture of digitalis (m.x.), with the decoction of scoparium, and the compound tincture of cardamoms; as well as the compound jalap powder and Epsom salts to increase the watery evacuations. The oedema diminished in a few days, but the pains in the back became worse. The left pupil was larger than the right. He showed symptoms of uraemia, and was given the hot packs. The urine contained large amounts of blood each day. He complained of pain in the left shoulder and left thigh. For this sodium salicylate was given, and he developed an erythematous rash on his sides which went on to the formation of blisters. The right arm also became erythematous, and likewise blistered. The patient was dry-cupped twice, and this relieved the pain over the back. He became progressively weaker and died, but was, however, conscious to the end.

Case 28.

Bright's Disease—Death from Uraemia. Kate Shea, aged 33, complained of palpitation and swelling in the legs of six months' duration. Present Illness.—Quite well six months ago when she had a miscarriage. She had a severe cold after this and coughed up blood occasionally. Palpitation began to trouble her, and then she noticed that her legs were swollen. Her breathing has been bad ever since and her appetite very poor. Previous Illnesses.—Has had 3 miscarriages; also influenza; but neither rheumatism nor scarlet fever. Family History.—Father died of dropsy; mother of pneumonia following influenza. One brother died of cerebral haemorrhage. On Examination.—Oedema of ankles and eyelids. Heart.—Palpitation very marked. No hypertrophy. Systolic mitral murmur. Accentuation of the second sound, which, with the first, is very loud and rough. Lungs.—Breathless and coughing. Expansion fair. Breath sounds harsh at apices. Both bases are dull up to the angle of the scapula, and there are crepitant rales on both sides. Vocal resonance is increased at left base. Back.—The hollow of same painful. Urine.—Not markedly altered in amount; specific gravity 1010; alkaline; slight trace of albumin; no blood. Retinas.—Marked albuminuric retinitis on both
sides. Treatment and Course.—The insomnia resulting from her dyspnoea was treated with the bromides, and hot packs were given two or three times a day. Nevertheless, her breathing became more and more difficult, and she became comatose and died. The day before the fatal ending her urine contained blood.

Case 29.
Acute Bright's Disease after Scarlet Fever. Mary Clarke, aged 8 years, was recovering from an attack of scarlet fever, and, at a time when she was practically convalescent, caught cold. She became very puffy about the face and eyelids, and had some oedema of the ankles. Her urine, which had contained a little albumin earlier in the disease, became very scanty and quite red with blood. Her skin was dry and hot, and she had a temperature of 101°F. She was kept wrapped in blankets, and fed on milk and barley-water. Her urine, which measured only from 10 to 15 ounces at first and contained blood and epithelial cells, now became more abundant, and in a month the puffiness had quite gone. The urine still contained a little albumin and a few epithelial casts, but no blood. The patient was given small saline purges daily, and was clad in flannel. In six weeks she had still a very faint trace of albumin, but was otherwise quite well.

Case 30.
Acute Bright's Disease. William Barker, aged 35 years, passing very little water, in which a large amount of blood discovered,—a state of affairs of two days' duration. Previous Illnesses.—None. Present Illness.—Whilst travelling on foot to work patient got very wet, and foolishly sat in his wet clothes for some time. He felt sick the next day, and had some pain in the small of the back. He noticed blood in his water, and he has passed practically nothing but blood since. He has only passed about a breakfastcupful altogether during the day. Present State.—Patient is pale and has a puffy appearance. He has pain over the loins, and feels cold all over. His pulse is 105 per minute and of high tension, but there is no atheroma. The heart is neither enlarged nor hypertrophied. His temperature is 100.2°F. The skin is dry. He has passed very little urine, and it contains a large amount of bright blood. There is no oedema of the legs nor any anaerobic condition. The urine is slightly acid, and of 1020 specific gravity. It contains blood and albumin in large amounts; and, under the microscope, there are to be seen red blood-cells, and a few blood and epithelial casts. Treatment and Termination.—The patient was wrapped in hot blankets, and given pilocarpine hypodermically. He was kept entirely on a milk diet. He passed a little more urine for a day, but developed symptoms of uraemia after that. He had a severe attack of epistaxis, and this relieved his headache for a time. He was given hydratecathartics also; but he became unconscious on the fourth day of the disease, and has suppression of urine. Death occurred the same night.

FINIS.