

a halt. Presently, distress after eating, even epigastric pain, flatulence, and irregularity in the stools, are experienced. Acidity, pyrosis, depressing nausea, with headache, come, as the case progresses, to be very constant symptoms. The body-weight declines, the skin becomes dry, scurfy, and of a dead yellowish-white or fawn color, and the hair appears dry and lifeless. The strength fails, and the breathing becomes labored on making any exertion. This is due partly to the losses of material and partly to the changes occurring in the heart. The left cavities undergo hypertrophy, and the arterioles throughout the body are in a state of abnormally high tension, owing to hypertrophy of their muscular layer; hence the radial pulse exhibits an exalted tension and force. Much discussion has occurred as to the existence of this thickening of the muscular fibers of the tunica media, and as to the causes, but the fact seems now firmly established. The obstacle to the circulation produced by the abnormal tension in the arterioles is the chief if not the only factor in causing hypertrophy of the left ventricle. Toward the end, however, a change takes place in the hypertrophied muscle: it undergoes fatty degeneration; then the cardiac movements become weak, the sounds indistinct, and the circulation feeble. In this form of kidney-disease there is usually no dropsy. It is true, œdema may occur from various complicating conditions, if not from the kidney-disease. When urine can no longer be separated from the blood by the damaged organs there will be dropsy, but death takes place with the phenomena of uræmia. When some lesion of a valve occurs, especially if of the mitral, œdema will appear in the ankles and face. Pleural inflammation or hepatic disease may result respectively in hydrothorax or ascites. Although the dropsy is never sufficient to cause death—is never anything more than an œdema of the face and extremities—yet death may be due to a sudden œdema of the lungs. When the case is approaching its termination, the symptoms of uræmia develop. The nausea which had existed before, with occasional vomiting, increases, becomes incessant, and the vomiting is violent and uncontrollable. The vomiting is not necessarily excited by the presence of food; it occurs when the stomach is empty, in the early morning; and after severe and protracted retching only a little mucus, with a quantity of watery fluid of low specific gravity and very feeble acidity, comes up. Diarrhœa also now gradually increases, and toward the end becomes uncontrollable, the stools being thin, abundant, and frequent. At last the evacuations consist of a watery fluid, with some mucus, and very little fecal matter, and occur involuntarily. The vomiting and purging are largely vicarious of the urinary secretion, which contains less and less solid matter. The profuse discharges are very exhausting, and consequently serve to develop the symptoms proper to uræmia. There is, now, an increasing headache; much vertigo is experienced; hebetude of mind and a soporose state come on, so that when his attention is withdrawn from persons and things the patient

falls asleep in his chair, but sleep at night is disturbed by vivid dreams, and there are much muscular twitching, jerking, and heavy, irregular breathing. Unsymmetrical convulsive movements, jactitations of individual muscles and groups of muscles, of the face or extremities, and general convulsions, occur as the case approaches the end. The patient when fully aroused may still be entirely conscious, but he soon lapses into stupor when left to himself; there may be maniacal delirium and violent struggling, or unconsciousness between the convulsive seizures. An early symptom in many cases of interstitial nephritis is amblyopia, double vision, hemiopia, and other derangements of vision. As has been pointed out, these symptoms may be the first to attract attention, so that the diagnosis is made by the oculist. When the examination is made by the ophthalmoscope at an early period, the optic disks are found to be swollen; the veins are enlarged and tortuous, while the arteries are rather shrunken. Whitish spots appear on the retina, of various sizes, and hæmorrhagic extravasations occur along the vessels, but both chiefly about the disks and in the neighborhood of the macula lutea. Both eyes are affected, but in varying degrees.\* While these obvious changes occur during the course of the disease, and are permanent, there are fugitive attacks in which vision may be lost without any retinal changes. Just as there may be muscular twitchings, and even convulsions, without any permanent lesions, so there may be entire loss of vision without any alterations of the retina.

**Course, Duration, and Termination.**—Interstitial nephritis is a very chronic malady. There is a long period (often several years) from the beginning of frequent micturition to the occurrence of impaired functions elsewhere. In those cases marked, as has been pointed out, by violent initial symptoms, the disease in the kidneys has proceeded silently, and, interfering with no function, has caused no disturbance until the sudden outbreak. It sometimes happens that a man falls in the street, is violently convulsed, and dies in a few hours comatose, the real lesion in the kidney having gone on unobserved for months and years, it may be. The duration of the disease can not, therefore, be definitely expressed. The termination is most usually with uræmia—convulsions, coma, and death. The changes in the vessels and the hypertrophy of the heart are the causes of cerebral hæmorrhage with which many cases end. The excrementitious matters circulating in the blood give rise to inflammations of the serous membranes, notably pericarditis and endocarditis, which prove fatal. Death may be caused by hæmorrhages from the mucous surfaces, or from the exhaustion caused by violent vomiting and purging.

**Diagnosis.**—The recognition of this disease, when the existence of albuminuria has been ascertained, can never be difficult. The large quantity of urine, the absence of color, the low specific gravity, the

\* "On the Use of the Ophthalmoscope in Diseases of the Nervous System and of the Kidneys," Dr. T. Clifford Allbutt, chapter vii, London: Macmillan & Co.

small amount of albumin, the hyaline casts, the hypertrophied heart and arterioles, are to be compared with the small quantity of urine, the high color, the high specific gravity, the immense quantity of albumin and granular casts, the rapid, large, and general accumulation of fluid. These prominent features from the clinical standpoint readily separate interstitial and parenchymatous nephritis. Pathologically, the small, tough, granular kidney and the large, soft, pale, and smooth kidney are perfectly distinct.

**Treatment.**—As interstitial nephritis is an incurable disorder when the proper secreting structure of the organ is destroyed, it is important to arrest the initial changes, if we possess the means of so doing. Those cases arising from syphilitic infection, or from plumbic or other metallic poisoning, offer the best prospect of cure, if the proper remedies are applied. It is in the cases arising from these causes, probably, that such good results are obtained by the persistent use of full doses of the iodide of potassium. The author has observed several cases in which the iodides seemed to arrest the disease permanently, and others in which the corrosive chloride, administered in small quantity (one twentieth of a grain) for a lengthened period, effected cures under apparently very unpromising circumstances. Better results even, the author believes, are procured from the careful and persistent administration of the chloride of gold and sodium. Very unpromising cases have, apparently, yielded to this remedy. It is usually given in pill,  $\frac{1}{15}$  to  $\frac{1}{20}$  grain being given three times a day persistently. Similar therapeutical properties are possessed by arsenic. In sclerosis of the liver, as well as in that of the kidney, we find that arsenic exercises a favorable influence in retarding the changes. This remedy is all the more desirable since it has, in small doses, a sedative effect on the stomach, and promotes appetite and digestion. These remedies, intended to arrest the hyperplasia of the connective tissue, should be prescribed with a definite relation to the presumed cause—iodide of potassium and bichloride of mercury, in those with a syphilitic history; iodide of potassium, in those poisoned by lead; and chloride of gold and arsenic, in those cases of unknown origin. When there are much acidity, flatulence, and pain after food, mineral acids, especially the nitric, taken before meals render important service. Doubtless the uric-acid diathesis is a very influential factor in the development of the disease, and hence those remedies which lessen its formation are deserving of high consideration. The utility of the mineral acids consists in preventing the acid fermentation of the food and in promoting digestion, so that the nitrogenous constituents are better prepared for assimilation. For the anæmia present, iron is generally prescribed, but the effects are usually rather disappointing. The most useful chalybeate is the tincture ferri acetata, which is also formed extemporaneously in Basham's mixture, composed of tinct. ferri chloridi, liquor ammoniæ acetatis, and acetic acid. If iron is given freely and for a

long time, headache and a disordered stomach will require its discontinuance; nevertheless, the occasional and careful use of iron is beneficial. Remarkable results have been achieved by the use of nitro-glycerine. It lessens the high tension of the vessels, relieves the pain in the head, and removes many of the disagreeable subjective sensations. By dilating the arterioles this remedy probably, also, improves the nutrition of the kidneys. The author has usually given this remedy in the form of the one per cent. solution, beginning with one drop and increasing the dose until its physiological effects are experienced. The dose in this form of the remedy is more easily regulated. The chloride of gold and sodium may be administered coincidentally. When the symptoms of uræmia come on, the case requires most careful handling. If the stomach and intestines are yet capable of good work, the treatment may be more direct and efficient; but if the severe, even uncontrollable vomiting and purging occur, so often present as a part of the uræmia, the difficulties of the management are greatly enhanced. In the former case, active purgatives, as elaterium, croton-oil, and compound jalap powder, procure elimination through the intestinal canal, and are of signal service. In the latter case, the important results derived from purgatives are precluded. Diaphoretics, as the vapor or hot-air bath and the injection subcutaneously of pilocarpine, are the most powerful means of relief. Purgatives and the vapor-bath, or pilocarpine, will in those cases of acute exacerbation in the renal trouble, when the patient is yet in good condition, relieve the symptoms remarkably, and subsequently there may be a long period of tolerable health. The convulsive and nervous phenomena of uræmia are best remedied by the means for procuring elimination, but, if the symptoms are urgent, the inhalation of amyl nitrite, chloroform, and ether may be necessary. The hypodermatic injection of morphine in large doses has been shown by Loomis, of New York, to have a remarkable influence on the convulsions of uræmia; but chloral by the stomach or rectum may be better.

The nutrition of the patient is of the first consequence. The diet should be simple, and consist of milk, eggs, a little fresh meat (once a day), and fruits, if diarrhœa does not exist. The best results have been obtained from an exclusive milk-diet; as this becomes irksome, intolerable even, the plan of diet just suggested is best. Malt liquors, spirits, and wines are highly objectionable, especially the first named. The clothing should be warm; flannel should be worn by day, and the patient should sleep between blankets. Whenever his means will permit, the patient should seek a warm, dry, and uniform climate. Recent observations by Drs. Sparks and Bruce in respect to the influence of diet, rest, and exercise, on the excretion of albumin, have led to the following results: the amount of albumin is much reduced by a milk-diet and non-nitrogenous food, and "absolute rest remarkably reduced the amount of albumin."\*

\* "Medico-Chirurgical Transactions," 1879, p. 254.

**HÆMATURIA—HÆMATINURIA—HÆMOGLOBINURIA.**

**Definition.**—By *hæmaturia* is meant the discharge of blood in the urine. It is a symptom rather than a disease, and is discussed in connection with maladies of which it is a part. *Hæmatinuria* signifies the presence of blood coloring matter in the urine, and is a paroxysmal affection, accompanied by constitutional disturbance, and most frequently caused by malarial toxæmia. It is also designated *hæmoglobinuria*.

**Pathogeny.**—Sex is an important factor in the pathogeny of this affection, males being most frequently (ten to one) the subjects of it. Youth and adult life are the periods during which it appears, and after fifty it is very uncommon. The chief cause of hæmatinuria is malarial poisoning, and hence the disease is encountered within the malarial zone. In the Southern States, especially in Alabama, it is becoming more frequent, and the severe or malignant form is now comparatively common. As a rule, it is irregularly intermittent, but there are many exceptions to the rule in that the morbid manifestations are remittent or continuous.

Although regarded generally as a modification of the blood, there are recent observations which tend to prove that a form of nephritis is also necessary.\* The essential condition is a disorganization of the blood-corpuscles, separation of the hæmatin, and such a change in the walls of the capillaries as to permit transudation of these elements.

**Symptoms.**—The attacks of hæmatinuria are severe in proportion to the local activity of the malarial poison. Within the tropics the maximum violence of all the symptoms is reached. It is usual to describe two forms—the mild and the severe—but it is quite certain that between the extremes there are numerous gradations in the severity of the manifestations dependent on the climatic conditions. The persons attacked, boys or men usually, have been exposed to malarial infection if not attacked with malarial fever. In the mildest cases the onset of the hæmatinuria is announced by the sudden appearance of bloody-looking urine, some lassitude, chilliness or coldness of the hands and feet, muscular pains and weariness, yawning, blue lips and finger-nails, followed by a reaction stage, fever, terminating in a sweat of greater or less severity. With the subsidence of these symptoms, the urine changes in appearance, the blood coloring matter disappears and the normal is restored, and the general health may be entirely recovered. In the severest form the chill approaches the congestive in character; there is profound depression of the powers of life; vomiting occurs; the urine becomes deeply colored, the skin yellow, and the fever high, remittent in type, or passing into continued.

The most characteristic feature in every way, and that which

\* Ponfick, Virchow's "Archiv," vol. lxxxviii, p. 476. Also, Lebedeff. *Ibid.*, vol. xci, p. 267.

gives it most importance, is the appearance of the urine. The color varies from a slight reddish tinge to a deep port-wine, and the deposit which collects on standing is composed of the *débris* of disintegrated blood-corpuscles, epithelium of the tubules, amorphous urates, and sometimes brownish casts of a hyaline character, or made up of disintegrating blood-globules, or pigment-matter. Albumin is present in considerable quantity, and blood-disks sometimes, but usually the bloody appearance of the urine is due to the blood-pigment in a granular form or dissolved, and the reaction is decidedly acid, rarely alkaline. When the paroxysm is over, the abnormal coloration lessens, then ceases, the albumin disappears, and in a few hours the urine becomes healthy. When the next paroxysm comes on the same phenomena occur. The malarial poison must then, directly, or through the agency of some substance formed in the intestinal canal, act on the blood-corpuscles, extract the hæmoglobin which is dissolved in the serum and eliminated by the kidneys, or which destroys the corpuscles in the liver, spleen, and kidneys. When the blood is examined, the white blood-disks are found to be increased in number, and the red are paler in tint, and exhibit no tendency to form the characteristic *rouleaux*, or the color disappears entirely, and the disks are changed in shape.

Urticaria often manifests itself, especially on parts exposed to cold, and the skin has either an icterode hue or is deeply jaundiced, which passes off after the systemic disturbance is entirely ended.

**Course, Duration and Termination.**—As seen in this country, hæmatinuria is a distinctly periodical affection; occurring with considerable regularity, and accompanied by the usual systemic disturbances of a malarial fever. Not all the cases are regularly intermittent and paroxysmal; some of them are remittent; a few continued in type. The intermittent cases may be free from fever, the urinary symptoms apparently taking the place of the usual chill, fever, and sweat. It has no fixed period of duration, and may last indefinitely, but much depends on the rôle of malaria in its production, and the appropriate use of quinine. In the author's experience it has a decided tendency to recur again and again, after it has been entirely relieved, and the normal condition of the urine and the blood restored. Chronic nephritis is an outcome of some cases, and intercurrent diseases, especially pneumonia, are apt to occur.

**Diagnosis.**—Hæmatinuria is distinguished from hæmaturia, with which, necessarily, it is most frequently confounded, by the presence of the blood-pigment without the blood-globules, at least in their normal form, by its periodical character, by the absence of the local lesions producing the latter, and by the presence of casts in the urine. Cancer of the kidney is accompanied by hæmaturia, but in that case blood is present, the discharge of blood is not periodical, and fever is wanting. Cancer is accompanied by a marked cachexia, by decline in

health and strength before the local symptoms assume importance; hæmaturia as a rule does not impair the vital forces to any considerable extent, except during the paroxysms, and after these are ended a prompt return to the normal occurs.

**Treatment.**—The most important remedy is quinine, and that it must be given in large doses is the conclusion of the physicians of the South, who have the largest experience,\* and is the author's judgment, after considerable observation of the disease. The patient must be cinchonized, in anticipation of the seizure, whenever the time for recurrence can be fixed on, and attention must be given to the "septenary periods," so called, that the outbreaks which may occur at certain times, following the law of evolution of the malarial poison, may be prevented. Dr. Narcom advocates the use of morphine, and his view is confirmed by others. It may be given with the quinine, or administered hypodermatically at the onset of a paroxysm. According to Ralfe,† arsenic is a remedy of great value, not so much for the immediate relief of the paroxysms as for the improvement of the patient's condition and the prevention of subsequent seizures. He administers it persistently in the intervals. A combination of quinine, arsenic, and ergot, given regularly, for several months if need be, has a remarkable effect in bringing about improvement and cure.‡ Such a combination should be administered after the impression made by large doses of quinine has been effected.

#### THE AMYLOID DISEASE OF THE KIDNEYS.

**Definition.**—By the term *amyloid disease* is meant an affection characterized by the deposit of amyloid matter. As it occurs in the kidneys, this disease is known as *lardaceous kidney*, *waxy kidney*, because of the supposed resemblance to lard and wax respectively. By Dickinson the disease is distinguished by the title "depurative infiltration."

**Causes.**—The chief cause is suppuration, especially protracted suppuration of or connected with the cancellous structure of bones, or ulcerations affecting the skin and mucous membrane. It is necessary that the suppuration be profuse and protracted, but it is not necessary that it occur in bone only. But suppuration alone is not sufficient to cause the amyloid deposit. There must be a peculiarity of constitution precedent, for, of all exposed to this destructive malady

\* Dr. Thomas J. Turpin, of Forkland, Alabama, "The Treatment of Hæmorrhagic Malarial Fever" (pamphlet); Dr. W. A. B. Narcom, "Transactions of the North Carolina Medical Association" for 1874.

† "A Practical Treatise on Diseases of the Kidneys." London, 1885, p. 552.

‡ ℞ Quinina sulph., ʒj; ext. ergotæ (Squibb), ʒj; ferri arseniat., gr. iij. M. Ft. pil. no. xx. Sig.: One pill three times a day.

by suppuration, but a small number actually are affected by amyloid change. It is more apt to occur in those under the influence of chronic malarial poisoning, but more influential diathetic states are those of syphilis, scrofula, tuberculosis, and cancer—especially cancer.\* It is impossible to indicate in the present state of knowledge the relation of these cachexiæ to amyloid disease, but it seems pretty clear that more or less protracted suppuration coincided with the cachexia. According to Bartels, ulcerations of the intestines are more certain than ulcerations of any other mucous membrane to induce amyloid disease; and, further, that the suppurating center must have communication with air to possess this peculiar property. The amyloid deposits are not limited to one organ, but occur in the liver, spleen, intestinal canal, the supra-renal bodies, the lymphatic glands, the thyroid gland, and the kidneys.

**Pathological Anatomy.**—The term *amyloid*, or starch-like, was originally proposed by Virchow, because of the reaction under iodine, and the characteristic structure remotely resembling starch. The theory of Dickinson that this substance is fibrin deprived of its alkali, which has been eliminated from the body in the pus, has been completely disproved by the elaborate investigations of Mr. George Budd.† "The cells of an organ affected may be seen to become gradually distended with a translucent deposit, and soon an accumulation of a similar deposit takes place in the intercellular spaces also." There is present in the blood in the normal a considerable quantity of a substance, named by Seegen "dystropodextrin"—"a substance which agrees with lardacein (amyloid material) in its most specific characteristic." To account for lardaceous disease, then, it is only necessary to suppose that this dystropodextrin becomes insoluble, and is precipitated and deposited in the tissues. This substance reacts to iodine, just as the amyloid matter, and agrees with it in all other particulars, so that this theory is more plausible than any heretofore proposed. When the lardacein is deposited in the kidneys to a considerable extent, the organs are larger and heavier than normal, and are also very firm in texture. The capsule, which is very thin, is easily detached, and the surface of the kidney is pale, gray, or whitish, and has a glistening, even a polished, appearance. The cortical part is broad, but pale and anæmic, while the cones are dark and congested. On microscopic examination, the change that has taken place in the organ is found to have occurred along the renal vessels and in the vascular tufts of the glomeruli, at first at isolated points, and subsequently along the whole extent of these vessels. As the morbid process

\* "Transactions of the Pathological Society" of London, vol. xxx, p. 511; paper by Dr. Dickinson, and discussion.

† London "Lancet," February 28 and March 27, 1880; "Amyloid Degeneration," by George Budd, Jr.

extends, the afferent and efferent vessels, the vasa recta, and ultimately the renal epithelium and even casts, still contained within the tubes, are seen to be embraced in the degeneration or deposition. If a thin section of the kidney is laid on a white plate after being brushed over with the iodine solution (iodine and iodide of potassium), the branching lines and points of reddish-brown stand out prominently beside the pale yellow of the healthy tissues.\* Besides the kidneys, other organs of the body undergo the same change, but the kidneys may be affected alone. The supra-renal capsules, the liver, spleen, the intestinal canal, etc., are similarly affected. When an organ is thus infiltrated by this new material, its proper structure undergoes an atrophic degeneration by pressure. With the amyloid change may be associated interstitial or parenchymatous nephritis, especially the latter. It is more proper to say that during the progress of interstitial nephritis the amyloid degeneration comes on; hence the lardaceous or amyloid kidney may be more or less granular and contracted, instead of being enlarged and smooth. With lardaceous kidney are associated chronic ulceration of the lungs, and suppurating cavities, ulcerations of the intestines, diseases of bones and joints, syphilitic lesions of the mucous membrane, external integument, and scrofulous abscesses.

**Symptoms.**—As amyloid disease of the kidney arises during the course of some chronic wasting malady, its onset is necessarily obscured by the complexus of symptoms already prominent. There is, of course, a marked degree of anæmia produced by prolonged suppuration, and by amyloid changes in other organs besides the kidney. The urine is, as a rule, increased in amount and may be considerably so, especially in those cases complicated by interstitial nephritis, or it may be considerably diminished in quantity, when there coexists parenchymatous nephritis. But in genuine amyloid kidney the urine is increased, is pale, watery, and of very low specific gravity—1002 not unfrequently—and usually under 1006. When associated with parenchymatous nephritis the specific gravity may rise to 1030, or when, as may happen, the quantity passed is very low. The amount of urea and other solid constituents is much reduced when the quantity is great, and greater when the quantity of urine is small. The amount of urea excreted depends on two factors: on the functional activity of the liver and the extent of disease in the kidneys. Albumin is always present. At times, during the first implication of the kidneys in the morbid process, there may be none, and when present the quantity is sufficient to impart a faint cloudiness merely, but it becomes permanent as a constituent of the urine during the height of the disease, unless just at the close, when it may disappear again. The urine contains so little else

\* Safranine, an aniline product, is said to be an admirable test for amyloid matter. Sections are immersed in a very dilute watery solution. The amyloid matter is stained orange-yellow; the rest of the tissue, rose.

than water that the sediment is very small in amount, and hence it requires a good deal of urine to collect even a few casts. Only the hyaline casts are proper to this disease; they are perfectly transparent, homogeneous, and slender, so that they are seen only by careful management of the light. Large granular casts, blood-corpuscles, and renal epithelium may be present in considerable quantity when parenchymatous

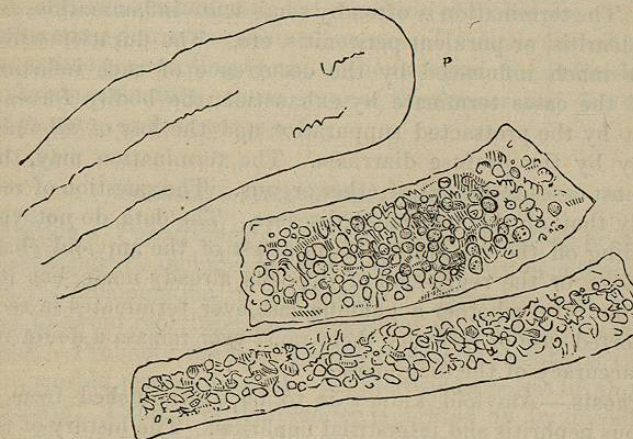


FIG. 41.—A Large Hyaline Cast without, and Two with Epithelium. (Beale.)

nephritis is a complication. The casts may present a faintly yellow and highly refracting appearance when attacked by the amyloid change or composed of the amyloid material.

More or less œdema is always present, but general dropsy is infrequent. The œdema is found in the lower extremities, and ascites is usually present, and disproportionate to the quantity of fluid elsewhere. This is doubtless due to the implication of the liver in the general morbid process, and to the swelling of the lymphatics in the hilus of the liver, compressing the vena porta. With the progress of the disease, there are necessarily increasing weakness and anæmia, a peculiar earthy or fawn color of the skin, and pigmentation of the eyelids. The exhaustion of the vital forces is greatly hastened by the occurrence of a profuse, watery, and uncontrollable diarrhœa. Vomiting also occasionally takes place, but not nearly with the frequency and persistence of the diarrhœa.

**Course, Duration, and Termination.**—Amyloid kidney is an essentially chronic malady, but its fortunes partake of the changes and progress of the associated malady. Commencing insidiously, its presence is recognized only when an increasing urinary discharge calls attention to the state of the kidneys. The duration of the disease is largely determined by the suppurating malady causing it; but, when the