quiescent stage, in which they are free from pain and enjoy excellent health, suffering only from the inconvenience and crippling necessarily associated with the disease.

Coincident affections are not uncommon. In the active stage the patients are often anæmic and suffer from dyspepsia, which may recur at intervals. There is no tendency to involvement of the heart.

The **partial** or **mono-articular** form affects chiefly old persons, and is seen particularly in the hip, the knee, the spinal column, or shoulder. It is, in its anatomical features, identical with the general disease. In the hip and shoulder the muscles early show wasting, and in the hip the condition ultimately becomes that already described as *morbus coxæ senilis.* These cases seem not infrequently to follow an injury. They differ from the polyarticular form in occurring chiefly in men and at a later period of life. One of the most interesting forms affects the vertebræ, completely locking the articulations, and producing the condition known as *spondylitis deformans.* When the cervical spine is involved the head cannot be moved up and down, but is carried stiffly. Usually rotation can be effected. The dorsal and lumbar spines may also be involved, and the body cannot be flexed in the slightest degree. No other joints may be affected.

Diagnosis.—Arthritis deformans can rarely be mistaken for either rheumatism or gout. It is important to distinguish from the mono-articular form the local arthritis of the shoulder-joint which is characterized by pain, thickening of the capsule and of the ligaments, wasting of the shoulder-girdle muscles, and sometimes by neuritis. This is an affection which is quite distinct from arthritis deformans, and is, moreover, in a majority of cases curable.

Treatment.—Arthritis deformans is an incurable disease. In many cases, after involvement of two or three joints, the progress is arrested. Too often it invades successively all the articulations, and in ten, fifteen, or twenty years the crippling becomes general and permanent.

The best that can be hoped for is a gradual arrest. It is useless to saturate the patients with iodide of potassium, salicylates, or quinine. Arsenic seems to do good as a general tonic. The improvement may be marked if large doses of it are given. Iron should be used freely, if there is anæmia. Careful attention to the digestion, plenty of good food, and fresh air are important measures. Hydrotherapy, with carefully performed massage, is best for the alleviation of the pain, and may possibly restrain the progress of the affection. In early cases local improvement and often great gain in the general strength follow a prolonged treatment at the hot mineral baths; but the practitioner should exercise care in recommending this mode of treatment, which is of very doubtful value when the disease is well established. I have repeatedly known cases to be rendered much worse by residence at these institutions. When good results, it is largely from change of scene and climate, and the careful

regulation of the diet. The local treatment is of benefit in arresting the progress. When there are much heat and pain the limb should be at rest, cold compresses applied at night, the joints wrapped in oiled silk, and in the morning thoroughly massaged. It is surprising how much can be done by carefully applied friction to reduce the thickening, to promote absorption of effusion, and to restore mobility. Massage is also of special benefit in maintaining the nutrition of the muscles, which early tend to atrophy. In the case of the knees this mode of treatment will sometimes prevent the retraction of the muscles and the gradual flexion of the legs on the thighs. No benefit can be expected from electricity.

VI. GOUT (*Podagra.*)

Definition.—A nutritional disorder, associated with an excessive formation of uric acid, and characterized clinically by attacks of acute arthritis, by the gradual deposition of urate of soda in and about the joints, and by the occurrence of irregular constitutional symptoms.

Etiology.—It is now generally recognized that the disease depends upon disturbed metabolism; most probably upon defective oxidation of nitrogenous food-stuffs.

Among important etiological factors in gout are the following:

(*a*) *Hereditary Influences.*—Statistics show that in from fifty to sixty per cent of all cases the disease existed in the parents or grandparents. The transmission is supposed to be more marked from the male side. Cases with a strong hereditary taint have been known to develop before puberty. The disease has been seen even in infants at the breast. Males are more subject to the disease than females. It rarely develops before the thirtieth year; and in a large majority of the cases the first manifestations appear before the age of fifty. (*b*) *Alcohol* is the most potent factor in the etiology of the disease. Fermented liquors favor its development much more than distilled spirits, and it prevails most extensively in countries like England and Germany, which consume the most beer and ale. Probably the greater tendency of malt liquors to induce gout is associated with the production of an acid dyspepsia. The lighter beers used in this country are much less liable to produce gout than the heavier English and Scotch ales. (*c*) *Food* plays a *rôle* equal in importance to that of alcohol. From the time of Hippocrates overeating has been regarded as a special predisposing cause. The excessive use of food, particularly of meats, disturbs gastric digestion and leads to the formation of lactic and volatile fatty acids. It is held by Garrod and others that these tend to decrease the alkalinity of the blood and to reduce its power of holding urates in solution. A special form of gouty dyspepsia has been described. A robust and active digestion is, however, often met in gouty persons. Gout is by no means confined to the rich. In England the combination of

poor food, defective hygiene, and an excessive consumption of malt liquors makes the "poor man's gout" a common affection. (*d*) *Lead.* Garrod has shown that workers in lead are specially prone to gout. In thirty per cent of his hospital cases the patients had been painters or workers in lead. The association is probably to be sought in the production by this poison of arterio-sclerosis and chronic nephritis. Something in addition is necessary, or certainly in this country we should more frequently see cases of the kind so common in London hospitals. Chronic lead-poisoning is here frequently associated with arterio-sclerosis and contracted kidneys, but acute arthritis is rare. Gouty deposits are, however, to be found in the big-toe joint and in the kidneys in these cases.

There are three theories with reference to gout:

(1) *The Uric-acid Theory.*—Sir Alfred Garrod, to whom the profession is indebted for so many careful studies in this disease, showed that there was an increase in the uric acid in the blood, due either to increased production or to diminished elimination; and that the alkalinity of the blood was also lessened. He attributes the deposition of the urate of soda to the diminished alkalinity of the plasma, which is unable to hold it in solution. An increase in the quantity of the uric acid produced, or any interference with elimination through the kidneys, may cause a sudden outbreak. The acute paroxysm is due to an accumulation of the urates in the blood, which he believes are responsible also for the preliminary dyspepsia, the coated tongue, the irritability of temper, and the general feelings of *malaise.* The sudden deposit of the crystalline urates about the joint leads to inflammation.

(2) *The Nervous Theory.*—The view of Cullen that gout was primarily an affection of the nervous system has been modified into a neuro-humoral view which has been advocated particularly by Sir Dyce Duckworth. On this theory there is a basic, arthritic stock—a diathetic habit, of which gout and rheumatism are two distinct branches. The gouty diathesis is expressed in (*a*) a neurosis of the nerve-centres, which may be inherited or acquired; and (*b*) "a peculiar incapacity for normal elaboration within the whole body, not merely in the liver or in one or two organs, of food, whereby uric acid is formed at times in excess, or is incapable of being duly transformed into more soluble and less noxious products" (Duckworth). The explosive neuroses and the influence of depressing circumstances, physical or mental, point strongly to the part played by the nervous system in the disease.

(3) *Ebstein's Theory.*—A nutritive tissue disturbance is the primary change leading to necrosis, and in the necrotic areas the urates are deposited. This is not unlike the view of Ord, who holds that there is a tendency, inherited or acquired, to a special form of tissue degeneration.

Morbid Anatomy.—The *blood* shows an excess of uric acid, as proved originally by Garrod. The uric acid may be obtained from the

blood-serum by the method known as uric-acid thread experiment, or from the serum obtained from a blister. To ʒ ij of serum add ♏v–vj of acetic acid in a watch-glass. A thread immersed in this will show in a few hours an incrustation of uric acid. This is not, however, peculiar to gout, but occurs in leukæmia and chlorosis. The important changes are in the articular tissues. The first joint of the great toe is most frequently involved; then the ankles, knees, and the small joints of the hands and wrists. The deposits may be in all the joints of the lower limbs and absent from those of the upper limbs (Norman Moore). If death takes place during an acute paroxysm, there are signs of inflammation, hyperæmia, swelling of the ligamentous tissues, and of effusion into the joint. The primary change, according to Ebstein, is a local necrosis, due to the presence of an excess of urates in the blood. This is seen in the cartilage and other articular tissues in which the nutritional currents are slow. In these areas of coagulation necrosis the reaction is always acid and the neutral urates are deposited in crystalline form, as insoluble acid urates. The articular cartilages are first involved. The gouty deposit may be uniform, or in small areas. Though it looks superficial, the deposit is invariably interstitial and covered by a thin lamina of cartilage. The deposit is thickest at the part most distant from the circulation. The ligaments and fibro-cartilage ultimately become involved and are infiltrated with chalky deposits, the so-called chalk-stones, or tophi. These are usually covered by skin; but in some cases, particularly in the metacarpo-phalangeal articulations, this ulcerates and the chalk-stones appear externally. The synovial fluid may also contain crystals. In very long-standing cases, owing to an excessive deposit, the joint becomes immobile. The marginal outgrowths in gouty arthritis are true exostoses (Wynne). The cartilage of the ear may contain tophi, which are seen as yellowish nodules at the margin of the helix. The cartilages of the nose, eyelids, and larynx are less frequently affected.

Of changes in the internal organs, those in the renal and vascular systems are the most important. The kidney changes believed to be characteristic of gout are: (*a*) A deposit of urates chiefly in the region of the papillæ. This is a less common change, however, than is usually supposed. Norman Moore found it in only twelve out of eighty cases. The apices of the pyramids show lines of whitish deposit. On microscopical examination the material is seen to be largely in the intertubular tissue. In some instances, however, the deposit seems to be both in the tissue and in the tubules. Ebstein, in his monograph, has described and figured areas of necrosis in both cortex and medulla, in the interior of which were crystalline deposits of urate of soda. The presence of these uratic concretions at the apices of the pyramids is not a positive indication of gout. They are not infrequent in this country, in which gout is rare. (*b*) An interstitial nephritis, either the ordinary "contracted kidney" or the arterio-sclerotic form, neither of which are in any way distinctive. It is

not possible to say in a given case that the condition has been due to gout unless marked evidences of the disease coexist.

The metatarso-phalangeal joint of the big toe should be carefully examined, as it may show typical lesions of gout without any outward token of arthritis.

Arterio-sclerosis is a very constant lesion. With it the heart, particularly the left ventricle, is found hypertrophied. According to some authors, concretions of urate of soda may occur on the valves.

Changes in the respiratory system are rare. Deposits have been found in the vocal cords, and uric-acid crystals have been met in the sputa of a gouty patient (J. W. Moore). Emphysema is a very constant condition in old cases.

Symptoms.—Gout is usually divided into acute, chronic, and irregular forms.

Acute Gout.—Premonitory symptoms are common—twinges of pain in the small joints of the hands or feet, nocturnal restlessness, irritability of temper, and dyspepsia. The urine is acid, scanty, and high-colored. It deposits urates on cooling, and there may be, according to Garrod, transient albuminuria. There may be traces of sugar (gouty glycosuria). Before an attack the output of uric acid is low and is also diminished in the early part of the paroxysm. In some instances the throat is sore, and there may be asthmatic attacks. The attack sets in usually in the early morning hours. The patient is aroused by a severe pain in the metatarso-phalangeal articulation of the big toe, and more commonly on the right than on the left side. The pain is agonizing, the joint swells rapidly, and becomes hot, tense, and shiny. The sensitiveness is extreme, and the patient describes the pain as if the joint were being pressed in a vice. There is fever, and the temperature may rise to 102° or 103°. Toward morning the severity of the symptoms subsides, and, although the joint remains swollen, the day may be passed in comparative comfort. The symptoms recur the next night, and the fit, as it is called, usually lasts for from five to eight days, the severity of the symptoms gradually abating. Occasionally other joints are involved, particularly the big toe of the opposite foot. The inflammation, however intense, never goes on to suppuration. With the subsidence of the swelling the skin desquamates. After the attack the general health may be much improved. Recurrences are frequent. Some patients have three or four attacks in a year; others at longer intervals. Lecorché has shown that the amount of uric acid is reduced prior to an attack, diminishes during the first two days, then increases very much and falls toward the close.

The term *retrocedent* or *suppressed* gout is applied to serious internal symptoms, coincident with a rapid disappearance or improvement of the local signs. Very remarkable manifestations may occur under these circumstances. The patient may have severe gastro-intestinal symptoms—pain, vomiting, diarrhœa, and great depression—and death may occur

during such an attack. Or there may be cardiac manifestations—dyspnœa, pain, and irregular action of the heart. In some instances in which the gout is said to attack the heart, an acute pericarditis develops and proves fatal. So, too, there may be marked cerebral manifestations—delirium and coma, and even apoplexy—but in a majority of these instances the symptoms are, in all probability, uræmic.

Acute gout is a rare disease in America, and in hospital practice is almost unknown. Among the well-to-do and even among club-men—a class particularly liable—it is infrequent, in comparison with the prevalence in the corresponding classes in England. Men in large family practice may pass a year or more without seeing a case. It has become more common, however, during the past twenty-five years.

Chronic Gout.—With increased frequency in the attacks, the articular symptoms persist for a longer time, and gradually many joints become affected. Deposits of urates take place, at first in the articular cartilages and then in the ligaments and capsular tissues; so that in the course of years the joints become swollen, irregular, and deformed. The feet are usually first affected, then the hands. In severe cases there may be extensive concretions about the elbows and knees and along the tendons and in the bursæ. The tophi appear in the ears. Finally, a unique clinical picture is produced which cannot be mistaken for any other affection. The skin over the tophi may rupture or ulcerate, and about the knuckles the chalk-stones may be freely exposed. Patients with chronic gout are usually dyspeptic, often of a sallow complexion, and show signs of arterio-sclerosis. The pulse tension is increased, the vessels are stiff, and the left ventricle is hypertrophied. The urine is increased in amount, is of low specific gravity, and usually contains a slight amount of albumen, with a few hyaline casts. Patients with chronic gout may show remarkable mental and even bodily vigor. Certain of the most distinguished members of our profession have been terrible sufferers from this disease—notably the elder Scaliger, Jerome Cardan, and Sydenham, whose statement that "more wise men than fools are victims of the affection" still holds good.

Irregular Gout.—This is a motley, ill-defined group of symptoms, manifestations of a condition of disordered nutrition, to which the terms *gouty diathesis* or *lithæmic state* have been given. Cases are seen in members of gouty families, who may never themselves have suffered from the acute disease, and in persons who have lived not wisely but too well, who have eaten and drunk largely, lived sedentary lives, and yet have been fortunate enough to escape an acute attack. It is interesting to note the various manifestations of the disease in a family with marked hereditary disposition. The daughters often escape, while one son may have gouty attacks of great severity, even though he lives a temperate life and tries in every way to avoid the conditions favoring the disorder. Another son has, perhaps, only the irregular manifestations and never the acute articu-

lar affection. While the irregular features are perhaps more often met with in the hereditary affection, they are by no means infrequent in persons who appear to have acquired the disease. The tendency in some families is to call every affection gouty. Even infantile complaints, such as scald-head, naso-pharyngeal vegetations, and enuresis, are often regarded, without sufficient grounds, I believe, as evidences of the family ailment. Among the commonest manifestations of irregular gout are the following:

(*a*) *Cutaneous Eruptions.*—Garrod and others have called special attention to the frequent association of eczema with the gouty habit. The French in particular insist upon the special liability of gouty persons to skin affections, the *arthritides*, as they call them.

(*b*) *Gastro-intestinal Disorders.*—Attacks of what is termed biliousness, in which the tongue is furred, the breath foul, the bowels constipated, and the action of the liver torpid, are not uncommon in gouty persons.

(*c*) *Cardio-vascular Symptoms.*—With the lithæmia, arterio-sclerosis is frequently associated. The blood tension is persistently high, the vessel walls become stiff, and cardiac and renal changes gradually develop. In this condition the manifestations may be renal, as when the albuminuria becomes more marked, or dropsical symptoms supervene. The manifestations may be cardiac, when the hypertrophy of the left ventricle fails and there are palpitation, irregular action, and ultimately a condition of asystole. Or, finally, the manifestations may be vascular, and involvement of the coronary arteries may cause sudden death. Aneurism may develop and prove fatal, or, as most frequently happens, a blood-vessel gives way in the brain, and the patient dies of apoplexy. It makes but little difference whether we regard this condition as primarily an arterio-sclerosis or as a gouty nephritis; the point to be remembered is that the nutritional disorder with which an excess of uric acid is associated induces in time increased tension, arterio-sclerosis, chronic interstitial nephritis, and changes in the myocardium. Pericarditis is not infrequent in connection with the granular kidney met with in gout.

(*d*) *Cerebral Manifestations.*—Headache is frequent. Haig has called special attention to the association of this symptom with retention of uric acid in the system. Neuralgias are not uncommon; sciatica and paræsthesias may develop. A common gouty manifestation, upon which Duckworth has laid stress, is the occurrence of hot or itching feet at night. Cramps in the legs may also be very troublesome. Hutchinson has called attention to hot and itching eyeballs as a frequent sign of masked gout. More serious cerebral manifestations result from a condition of arterio-sclerosis. Apoplexy is a common termination of gout. A low meningitis may develop, usually basilar.

(*e*) *Urinary Disorders.*—The urine is highly acid and high-colored, and may deposit on standing crystals of lithic acid. Transient and temporary increase in this ingredient cannot be regarded as serious. In many cases of chronic gout the amount may be diminished, and only increased at certain periods, forming the so-called uric-acid showers. Sugar is found intermittently in the urine of gouty persons—gouty glycosuria. It may pass into true diabetes, but is usually very amenable to treatment. Oxaluria may also be present Gouty persons are specially prone to calculi, Jerome Cardan to the contrary, who reckoned freedom from stone among the chief of the *dona podagræ*. Minute quantities of albumen are very common in persons of gouty dyscrasia, and, when the renal changes are well established, tube-casts. Urethritis, accompanied with a well-marked purulent discharge, may develop, so it is stated, usually at the end of an attack. It may occur spontaneously, or follow a pure connection.

(*f*) *Pulmonary Disorders.*—There are no characteristic changes, but, as Greenhow has pointed out, chronic bronchitis occurs with great frequency in persons of a gouty habit.

(*g*) Of eye affections, iritis, glaucoma, hæmorrhagic retinitis, and suppurative panopthalmitis have been described.

Treatment.—Individuals who have inherited a tendency to gout, or who have shown any manifestations of it, should live temperately, abstain from alcohol, and eat moderately. An open-air life, with plenty of exercise and regular hours, does much to counteract an inborn tendency to the disease.

Diet.—Experience has shown that a modified nitrogenous diet is the most suitable. Starchy and saccharine articles of food are to be taken in very limited quantities; as "the conversion of azotized food is more complete with a minimum of carbohydrates than it is with an excess of them—in other words, one of the best means of avoiding the accumulation of lithic acid in the blood is to diminish the carbohydrates rather than the azotized foods" (Draper). Meats of all kinds, except perhaps the coarser sorts, such as pork and veal, and salted provisions, may be used. Eggs, oysters, and fish may be taken. Lobsters and crabs, particularly when made into salads, are to be eschewed. The sugar should be reduced to a minimum. The sweeter fruits should not be taken. Oranges and lemons may be allowed. Strawberries, bananas, and melons should not be eaten. If necessary, saccharin may be substituted for cane sugar. Potatoes should be sparingly used. The fresh vegetables, such as lettuce, cucumbers, tomatoes, and cauliflower, may be taken freely. Hot rolls and cakes of all sorts, hominy, grits, and the more starchy forms of prepared foods are not suitable. The various articles of diet prepared from corn should be avoided. Fats are easily digested and may be taken freely. In obstinate cases great benefit is derived from an exclusively milk diet.

Persons with a gouty tendency should be encouraged to drink freely of such mineral waters as they prefer. They keep the interstitial circulation active and so favor elimination. Milk and potash-water form a pleasant and wholesome drink for a lithæmic patient. Alcohol in all forms

should be avoided. When from any cause a stimulant is indicated, claret, dry sherry, or good whisky is preferable. Champagne is particularly pernicious. Persons with a marked tendency to lithæmia should be urged to restrict the appetite and to take only a moderate amount of food. Over-eating is not far behind excessive drinking in its injurious effects. Indeed, a majority of people over forty years of age take more food than is required to maintain the equilibrium of health. Gout, in many cases, is evidence of an overfed, overworked, and consequently clogged machine.

The skin should be kept active: if the patient is robust, by the morning cold bath with friction after it; but if weak or debilitated, the evening warm bath should be substituted. An occasional Turkish bath with active shampooing is advantageous. The secretion of urine should be fully maintained, and the specific gravity reduced by diluents to at least 1·015. The bowels should be kept open and an occasional saline purgative may be administered. The patient should dress warmly, avoid rapid alterations in temperature, and be careful not to have the skin suddenly chilled. Gouty persons derive much benefit from taking certain waters, such as Saratoga, the Bedford, the White Sulphur of Virginia, in this country; the Bath and Harrogate, in England; and those of Carlsbad, Kissingen, Homburg, Vichy, and Contrexéville, on the continent.

In an acute attack the limb should be elevated and the affected joint wrapped in cotton-wool. Warm fomentations, or Fuller's lotion, may be used. Steaming the joint is sometimes beneficial. A brisk mercurial purge is always advantageous at the outset. The wine or tincture of colchicum, in doses of twenty to thirty minims, may be given every four hours in combination with the citrate of potash or the citrate of lithium. The colchicum should be carefully watched. It has, in a majority of the cases, a powerful influence over the symptoms; relieving the pain and reducing, sometimes with great rapidity, the swelling and redness. It should be promptly stopped as soon as it has relieved the pain. In cases in which the pain and sleeplessness are more distressing and do not yield to colchicum, morphia may be necessary. The patient should be placed on a low diet, chiefly of milk and barley-water, but if there is any debility, strong broths may be given, or eggs. It is occasionally necessary to give small quantities of stimulants. Potash water, Apollinaris, or Seltzer water should be taken freely. Waters with the sodium salts should be avoided. During convalescence meats and fish and game may be taken, and gradually the patient may resume the diet previously laid down.

In the chronic and irregular forms of gout the treatment by hygiene and diet is most suitable. Colchicum is not often required, though in small doses it is sometimes beneficial. Lithium salts do good, since a combination of uric acid with lithium is more soluble than the sodium salt. There is no good native lithia water. The medicine is best given

in potash water, in a glassful of which five grains of the citrate of lithium may be taken three times a day, or the *liquor lithiæ effervescens* of the British Pharmacopœia may be used. The mineral waters above mentioned are particularly beneficial, partly in themselves, and partly owing to the strict regulations to which the patient is subjected when taking the "cure." Ammoniacum, guaiacum, and preparations of quinine and iron are sometimes serviceable in the chronic gout. Iodide of potassium and the benzoates are also recommended. The local treatment of joints affected with chronic gout is not satisfactory. Hydrotherapeutic measures, the Paquelin, and massage may be tried.

VII. DIABETES MELLITUS.

Definition.—A disorder of nutrition, in which sugar accumulates in the blood and is excreted in the urine, the daily amount of which is greatly increased.

Etiology.—Hereditary influences play an important *rôle*, and cases are on record of its occurrence in many members of the same family. There are instances of the coexistence of the disease in husband and wife. Men are more frequently affected than women. It is a disease of adult life; a majority of the cases occur from the third to the sixth decade. It is rare in childhood, but cases are on record in children under one year of age. Persons of a neurotic temperament are often affected. It is a disease of the higher classes. Hebrews seem especially prone to it; one fourth of Frerichs' cases were of the Semitic race. In a considerable proportion of the cases of diabetes the subjects have been excessively fat at the beginning of, or prior to, the onset of the disease. It must be remembered, however, that a slight trace of sugar is not very uncommon in obese persons. This so-called lipogenic glycosuria is not of grave significance, and is only occasionally followed by true diabetes. There are instances on record in which obesity with diabetes has occurred in three generations. It is more common in cities than in country districts. Gout, syphilis, and malaria have been regarded as predisposing causes. Mental shock, severe nervous strain, and worry precede many cases. The combination of intense application to business, over-indulgence in food and drink, with a sedentary life, seem particularly prone to induce the disease. It may set in during pregnancy, and in rare instances may only occur at this period. Injury to or disease of the spinal cord or brain has been followed by diabetes. In the carefully analyzed cases of Frerichs there were thirty instances of organic disease of these parts. The medulla is not always involved. In only four of his cases, which showed organic disease, was there sclerosis or other anomaly of this part. An irritative lesion of Bernard's diabetic centre in the medulla is an occasional cause. I saw with Riess, at the Friedrichshain, Berlin, a woman who had anomalous