

called for in obesity. Also it will be noted that in both conditions the inclusion of fats in the diet facilitates the diminution in the harmful carbohydrate group. In applying even partial starvation methods for obesity, then, while we must limit the number of aliments allowed in order that the quantitative restriction may be more readily applied, we must beware of a too rapid and radical diminution in weight, and must make our regimen so tolerable that it can be continued as a permanency.

Charles F. Withington.

STASIS. See *Circulation, Pathology of.*

STATUS LYMPHATICUS.—(Synonyms: *Constitutio lymphatica*; *Lymphatic constitution*; *Lymphatic habitus*; *Lymphatic dyscrasia*; *Lymphatic diathesis*; *Lymphatic-chlorotic constitution*; *Lymphatism.*)

DEFINITION.—A so-called constitutional disorder characterized by a persistence or hyperplasia of the thymus and by general lymphadenoid hyperplasia, frequently associated with cardiac and arterial hypoplasia and the osseous evidences of rachitis.

HISTORY.—The term lymphatic diathesis is an old one in medical literature, and was no doubt applied to certain cases of status lymphaticus as above defined. Inasmuch, however, as scrofulous (see *Scrofula*) or tuberculous adenitis was particularly indicated by this ancient term, and that it was also applied to cases of pseudo-leukemia, chlorosis, and leukæmia, it is impossible to determine in how far it was definitely employed.

The most prominent anomaly of status lymphaticus, the persistent or enlarged thymus, was recognized by early pathological anatomists like Félix Plater (1614), Ch. Richa (1723), Bichat and Verdries (1726), and by Allan Burns, Franck, Kopp, Friedleben, and a number of others in the first half of the nineteenth century. (See also *Thymus, Diseases of.*) These pioneer students in their close attention to the thymus overlooked the accessory anatomical features of status lymphaticus; an error that has persisted to the present time and which has been productive of considerable confusion, since much of the literature bearing upon such clinical manifestations of status lymphaticus as laryngismus stridulus and sudden death is to be found by reference to the thymus alone. A clear conception of the lymphatic state was possessed by that pathological anatomist of wide and fruitful experience, Carl Rokitsky, who, in his text-book (1842-46), under the head of "Diseases of the Lymphatic Glands," mentions "lymphatic diathesis" or "lymphatic habitus." He observes that hypertrophy of the lymph glands occurs in childhood to puberty, or even beyond to mature life. The nodes of the abdomen (mesenteric and lumbar plexus) are most frequently involved, and this condition is commonly associated with hypertrophic development of other blood-forming organs, as, for instance, the thyroid gland, and more especially a highly developed spleen, "obstructed involution of the thymus," a hypertrophic state of the follicular apparatus of the intestines, and hypertrophy of the nervous centres. Such hypertrophies affect either the whole system or one portion, as, for instance, the glands of the abdomen. Under "Diseases of the Thymus Gland," Rokitsky says: "Its abnormal enlargement is almost entirely restricted to children, in whom we simultaneously observe a great predominance of the whole lymphatic system, rachitis, and hypertrophy of the brain." The hypoplasia of the heart and arteries, now acknowledged to be one of the frequently concomitant anomalies, commanded the attention of Wunderlich, Virchow, Rokitsky, Riegel, Kulenkampf, Bruberger, and Küssner between 1840 and 1880. On the assumption that vascular hypoplasia was fundamentally related to chlorosis, the condition was described by Virchow as the "lymphatic-chlorotic constitution."

Interest in the lymphatic state, both from the clinical and from the pathological standpoint, has recently been awakened, principally through the labors of the Vienna school, of which A. Paltauf, whose contribution in 1889 marked the new era, is a representative. The various

morbid anatomical features of status lymphaticus were emphasized by Paltauf and illustrated by a series of careful autopsic studies. He revived the name "constitutio lymphatica," which is widely prevalent in recent German contributions; although, notwithstanding the care with which Paltauf endeavored to demonstrate the accessory relationship of the enlarged thymus, one finds it still occupying the most prominent and often quite exclusive position in the reports of many recent writers.

MORBID ANATOMY.—*Thymus.*—The predominant anatomical feature of status lymphaticus and the one that attracts attention most readily is the enlarged or persistent thymus gland. In children below the period of puberty the thymus of the lymphatic state is usually larger than in normal individuals. The enlargement of this organ has been repeatedly noted in infants dying by one of the several usually abrupt modes characteristic of lymphatism, and, as has already been said, this striking anomaly has often been noted to the exclusion of other accessory features. Such expressions as "thymus swollen," "thymus much enlarged," "thymus hypertrophic," appear in the autopsy protocols, together with data referring to the size and weight of the organ. The enlarged organ, which usually retains its bilobed shape, extends from the isthmus of the thyroid well down upon the pericardium, sometimes even to its diaphragmatic junction. Laterally, the thymus spreads after passing beneath the sternoclavicular union, generally expanding into two leaf-like lobes which reach a combined width of 5 to 6 cm. The thickness varies from 0.5 to 3 cm. The length of the enlarged thymus in children varies from 6 to 8 cm.; and its weight has been recorded as from 20 to 53 gm. Recklinghausen reports a thymus "as large as the liver of a new-born infant" in a boy dying suddenly. A vigorous controversy has been waged as to the possibility of asphyxia from compression exerted by the swollen thymus upon the trachea at the point where the organ passes through the thoracic dome, the "critical space" of Grawitz, and some evidence seems to sustain the pressure theory as applicable to a few recorded cases.

It is generally conceded that the thymus in normal individuals undergoes an involution after the second or third year, and that this involution is usually complete at or soon after puberty (see *Thymus*). But in victims of status lymphaticus the involution of the thymus is retarded, in consequence of which a persistent and sometimes hypertrophic organ is encountered in adults, particularly those less than forty years of age. The location of this persistent thymus corresponds to that in children, and the state of enlargement varies in individuals as shown by the recorded weights of 20-135 gm.

Both in children and in adults the thymus of status lymphaticus resembles in appearance the normal organ of infancy. It is pinkish or flesh-like in color; and a distinct lobulation like that of the sweetbread of the calf, often with clearly outlined follicles, is seen. Its consistency is soft. Hemorrhages and consequent ecchymoses are present in certain cases, particularly those in which asphyxia has accompanied the sudden death. At times the thymus is the seat of an active hyperæmia, and a few instances are recorded in which a milky juice exuded from the cut organ.

The pathological histology of the thymus of status lymphaticus is not yet thoroughly elucidated, and more careful studies of a large material by the use of recent methods is highly desirable. In a general way it appears that the enlarged organ reproduces the microscopic structure of the normal thymus of infancy, differing only in the multiplication of the lymphoid cells which serve to increase the size of the follicles, and to produce new ones both in the normal sites and in the adipose tissue surrounding the gland proper. The normal division of the thymic follicle into cortex and medulla is usually retained, though the hyperplasia of lymphoid cells tends to invade the medulla and to infiltrate the trabeculae of the follicles. Some authors have described an increase of eosinophilic leucocytes in the enlarged thymus, but

we have evidence that this is not a constant feature. Endothelioid cell proliferation has also been described.

But while persistence and hypertrophy of the thymus is a prominent characteristic of status lymphaticus, it is not an invariable one, for we may have a non-thymic lymphatism in which general lymphadenoid hyperplasia and arterial hypoplasia exist with a thymus of normal size or one that has undergone perfect involution.

Further, it is well to recall that the anatomical evidences of the lymphatic state may be erased by a number of different causes, and that the thymus is one of the earliest structures so affected. Advanced years, particularly after the fortieth, usually induce rapid subsidence of the enlarged lymphatic structure. Various chronic diseases, and particularly those associated with debility, marasmus, and wasting, act similarly. Some acute diseases may produce the same effect.

Lymphadenoid Hyperplasia.—A generally hypertrophic state of the lymphadenoid tissue is, next after the anomaly of the thymus, the most noticeable evidence of status lymphaticus. This is shown by an increase in the size and number of the lymph follicles in various portions of the body. In the lymph glands, both superficial and deep, it is made apparent by their increased size and also, at times, by enlargement of the individual follicles. Sometimes the superficial lymph glands are not particularly augmented, while those of the abdomen, especially of the mesentery, are affected. Usually the enlarged lymph nodes remain discrete, but there may be a diffuse increase of lymphatic tissue, particularly in the mesentery.

In the respiratory and gastro-intestinal tracts the lymph follicles are generally very prominent. The faucial, lingual, and pharyngeal tonsils, with the intervening solitary follicles, and those at the base of the tongue, in the larynx, œsophagus, and stomach, participate in the process. In the intestines both the solitary follicles and those aggregated in Peyer's patches are unduly prominent. A distinct adenoid ring may appear occasionally in the duodenum, and more frequently at the ileo-cæcal junction. In the small intestine, and particularly in the lowermost portion of the ileum, the follicles of Peyer's patches may protrude above the surface of the mucosa, sometimes appearing as subspherical projections half a centimetre in height; and such augmented patches may reach a length of 9-11 cm. Here the solitary follicles also project prominently, at times even taking the appearance of polypoid outgrowths. In the colon an increased prominence of the solitary follicles, with their pit-like central areas still remaining, is observed. Taken as a whole, the hyperplasia of the lymphatic structures of the intestines in status lymphaticus closely simulates that seen in the stage of swelling of typhoid fever, and might readily be so mistaken.

The retroperitoneal lymph glands usually participate in the hypertrophy, to the same degree as that observed in the mesenteric nodes; and the bronchial glands are also involved, although not invariably. Of the superficial nodes, those of the inguinal, popliteal, axillary, cervical, supra- and infraclavicular regions may be affected to a varying degree, but usually not extensively. Collections of lymphoid cells have been described in the liver, thyroid, and bone marrow, and Kundrat cites a case in which red marrow was present in the shaft of the femur.

Spleen.—A moderate enlargement of the spleen is the rule in status lymphaticus, while the prominence of its Malpighian bodies is more striking. Generally, the splenic pulp is firm, the organ filling its capsule well. In cases of sudden death in individuals of robust condition the splenic pulp is hyperæmic. In the midst of the more or less deeply colored pulp the follicles composing the Malpighian bodies stand out with startling distinctness as pale round areas, often measuring 2-3 mm. across, and resembling large miliary tubercles.

Histologically one finds the enlarged Malpighian bodies to consist of closely packed small lymphoid cells, generally surrounding the arterioles and supplied with few blood-vessels, thus contrasting sharply with the adjacent

pulp tissue with its dilated and engorged blood sinuses. Not infrequently the hyperplastic lymphoid cells of a follicle will infiltrate diffusely into the adjoining pulp tissue, and at times small foci of lymphoid elements, without direct connection with a well-formed follicle, will be found scattered throughout the splenic substance.

The dilated sinuses of the splenic pulp are filled with blood, and in some cases evidence of extensive hæmolytic and the deposit of blood pigment appear in the pulp cells.

Cardiac and Arterial Hypoplasia.—In certain cases of status lymphaticus, particularly those coming under Virchow's class of "lymphatic-chlorotic constitution," a pronounced hypoplasia of the arteries, and sometimes of the heart as well, has been noted. Some authors have described a general arterial narrowing, others a narrowing of the aorta; in fact, so far as the aorta is concerned, a diminution in calibre has been pretty uniformly discovered. In view of our ignorance as to the causation of aortic narrowing, whether real or only apparent and due to varying degrees of elasticity, we are not prepared to assert just what is the nature of the change found in victims of status lymphaticus; but that the aorta, at times the general system of arteries, and rarely the heart, are smaller than the same structures in average normal individuals is unquestionable. Even in adult lymphatic males of full stature and well developed otherwise, an aorta measuring but 4 cm. in circumference at its cardiac end has been found, and a circumference of 5 cm. at the aortic ring is the rule. These narrow aortas are usually thin-walled and quite elastic. Rupture of such thin-walled arteries has been reported; and in certain cases in which the heart also was hypoplastic, a patent foramen ovale has been found.

Rachitic Bone Changes.—That there is a close morbid anatomic association of status lymphaticus and rickets is abundantly proven, particularly in the case of lymphatic infants. Still we are not at present in a position to say that all cases of status lymphaticus are associated anatomically with the rachitic dyscrasia, nor do all cases of rickets exhibit the evidences of lymphatism, though its coincidence with enlarged spleen and hyperplasia of the mesenteric nodes is well known. In infants dying in the lymphatic state a mild grade of craniotabes, the rosary, curvature of the long bones or spine, and enlarged epiphyses, have been manifested as rachitic osseous changes; and in older children or adults several instances of rachitic spinal curvature, pigeon breast, narrow pelvis, and curvature of long bones have been found. Microscopically the affected bones present the lesions characteristic of rickets.

Skin.—A thick skin and an increased fat layer have frequently been noted among the anatomical findings. In the skin an increase of the elastic elements has been described as a factor in augmenting its thickness. Pallor of the skin of the peculiar kind known as pasty ("pasteos") is looked upon as an evidence of lymphatism.

Blood.—Observations upon the blood in status lymphaticus are still meagre, and a unanimous opinion as to the characteristic alterations has not been reached. One would expect a lymphocytosis in these cases, and this has been reported in several cases. Thus Ewing found a pronounced increase in the number of mononuclear large and small lymphoid cells in the blood of one of his cases, and he suggests that further systematic search may reveal this as a constant condition. In the red cells no abnormality in number or structure has been detected.

Occasional Features.—In many of the cases of sudden death among the victims of the lymphatic state a pronounced active hyperæmia of the thoracic and abdominal viscera, and occasionally of the brain, has been described. Further, particularly in those sudden deaths in which asphyxia figured, hemorrhagic ecchymoses of the pericardium, thymus, pleura, and endocardium were present in the order of frequency of the structures mentioned.

Hypertrophy of the thyroid is a quite common accompanying anomaly. There may be a simple hypertrophy, a parenchymatous goitre, or a cystic goitre. In about

one-half of the reported cases the thyroid has been found enlarged.

Edema of the skin, or more commonly eczema, is occasionally found. Edema of the lungs has been discovered in some cases of sudden death in lymphatic individuals; and in lymphatic epileptics dying after one or several attacks, or from rapid status epilepticus, this condition is encountered as the general rule.

Hypertrophy of the brain is mentioned by Rokitsky as one of the features of status lymphaticus, at times combined with cerebral oedema or with widening of the ventricles and increase of intracerebral fluid. In some of the recently studied cases one or more of these conditions are mentioned, and, in certain epileptics in the lymphatic state, general cerebral hypertrophy, localized hypertrophy, oedema, or hydrocephalus may appear.

On the side of the sexual organs peculiarities are occasionally encountered. A retarded development of the external genitals and the delayed appearance of the beard, the pubic and axillary hair in the male, are examples of these. In the female an infantile (and sometimes double-horned) uterus with undeveloped tubes, ovaries, and mammae, together with a masculine aspect of the whole body, are likewise occasionally found.

Before dismissing the subject of the morbid anatomy of status lymphaticus we should emphasize the fact that a number of the characteristic features are profoundly modified by the individual's state of nutrition. In those victims of status lymphaticus who die suddenly in a good state of nutrition such anomalies as the large thymus, lymphadenoid hyperplasias, and thick fat layer appear prominently; but when nutrition has suffered through the exhausting influence of chronic diseases or the rapid wasting of certain acute affections, these structures atrophy along with the rest of the body. On the other hand, the aortic or arterial hypoplasia, and the osseous changes of ancient rickets are ineradicable, though these, it must be remembered, are not invariably present.

Again, one may find status lymphaticus associated with certain other diseases and their anatomic changes, as, for example, Basedow's disease, struma, scrofula, and pseudo-leukæmia.

CLINICAL MANIFESTATIONS.—Status lymphaticus has been found in a number of diseases in which the association seems to have been more than a mere coincidence.

Thymic Asthma.—Up to very recent times that peculiar spasmodic neurosis known as spasm of the glottis, laryngismus stridulus, child-crowing, or by the term "asthma thymicum" given by Kopp in 1824, has been looked upon as having its morbid anatomical basis in an hypertrophy of the thymus. But in the last decade more exhaustive studies have disclosed one or several of the other features of the lymphatic state in these cases, and there need now be little hesitancy in considering this affection as one of the clinical evidences of the latter condition and in describing it in this connection.

Thymic asthma, a disease of infancy, may be defined as a paroxysmal suffocation, and is a not uncommon cause of sudden death, especially between the fourth and tenth months. Its symptomatology has been well described by Kopp, and more recently by Pott. In a typical fatal attack the child suddenly jerks its head backward with a sharp noisy inspiration like that of whooping-cough, but sharper and shallower; the eyes are upturned, fixed, and pupils dilated; the face has a painful, anxious expression, is blue at first and then pallid; the nostrils are dilated. The tongue swells and arches so as to press against the hard palate, while the veins of the neck become engorged and stand out prominently. The arms assume a condition of tonic extension with fists clinched and thumbs turned into the palms. The legs become extended, great toes abducted and dorsally flexed. An attitude of opisthotonos is assumed by the spine. A convulsive tremor of the facial muscles and an ineffectual gasping inspiratory attempt follow. Suddenly the spasm ceases, the face becomes ashy, then cyanotic; the tongue and lips are livid; and after one or two minutes the child is a corpse. Urine and feces are

involuntarily passed if artificial respiration is attempted. The heart ceases its activity at the onset of the paroxysm; its sounds are inaudible and the pulse is absent. Reflex irritability is lost. In attacks not fatal the clinical phenomena resemble those just described; there is the abrupt onset, the paroxysm of suffocation and convulsive movements of various groups of muscles, often with involuntary evacuations, and occasionally with complete loss of consciousness. Friedleben, one of the older observers, states that these attacks occur most frequently in well-nourished infants, though they may appear in the debilitated. The interval between the spasms may be hours, days, or weeks, though they tend to increase in frequency and severity. Twenty to forty attacks have been noted in twenty-four hours. The period of the first dentition is the one particularly prone to this affection, though it has been recorded in the new-born infant. The so-called idiopathic spasm of the glottis of adults is probably dissimilar at least in so far as its relations to status lymphaticus are concerned, though this point has not been definitely settled.

Thymic asthma and thymic sudden death in infants stand so closely allied as to make a separate consideration unnecessary, for while many infants have succumbed suddenly, in which, for want of actual observation or for lack of trained observation, none of the symptoms of thymic asthma has been described, it is highly probable that one or more of the convulsive phenomena just mentioned actually preceded death. Many of these sudden deaths in infants are tragic occurrences, and not infrequently they have called for medico-legal investigation. Some of the children in seeming good health have expired abruptly in the presence of spectators or even in their parents' arms (Grawitz and others); they have been found dead in bed, and suspicions of foul play have been entertained against a mother or nurse under these circumstances; or death has been ascribed to suffocation in the bedclothes. Some, at least, of the deaths from fright recorded among children doubtless belong to this same category, and here also probably belong those occasional instances in which animals like cats or dogs have been suspected of causing the death of infants, as in those popularly described as "cats sucking the breath."

As to the etiology of thymic asthma and thymic sudden death the controversy aroused by Kopp's theory is still waging. Kopp maintained that the weight of the enlarged thymus on the heart, lungs, and great vessels induced the spasm of the glottis either by direct pressure or by irritation of the recurrent laryngeal nerve. Even to the present time the mechanical theory advanced by Kopp is accepted by some authors, or the modification of it proposed by Grawitz, who held that direct compression of the trachea is produced by the swollen thymus at the point where it emerges from the dome of the thorax ("critical space"), particularly when the head is suddenly drawn backward. Ever since the time of Friedleben's masterly studies upon the diseases of the thymus (1858) the pressure theory has been combated, and a large controversial literature has appeared. That the mechanical factors are concerned in some of these cases seems undeniable, but even in those in which the marks of tracheal compression are indubitable, it is still impossible to say that compression alone was the active agency in exciting the spasm or the sudden death. Because of the inadequacy of the mechanical theory to explain the majority of the cases, the tendency in the last few years has been more and more toward the view advanced by Pott, and extended by Paltauf. Pott believed the fatal issue to be ascribable to sudden arrest of the heart, though he charged the cardiac affection to the results of pressure of the suddenly congested and already hypertrophied thymus upon the trachea, pulmonary artery, and right auricle. Paltauf also ascribes thymic sudden death to a spasmodic arrest of the heart, but he goes beyond the thymus and looks to status lymphaticus as the responsible condition. He points out that the enlarged thymus coexists with general lymphadenoid hyperplasia, and arterial hypoplasia—that is, with the

lymphatic state—and that the victims of this dyscrasia possess a lowered vital resistance and a particular proneness to convulsive disorders, among which cardiac or respiratory spasm or paralysis are the most dangerous. In this light, spasm of the glottis or thymic asthma becomes a reflex respiratory spasm, and thymic sudden death a reflex cardiac paralysis, both in some way dependent upon the exaggerated irritability incidental to status lymphaticus.

Infantile Eclampsia.—That teething fits are often associated with rickets has been pointed out by a number of authorities. The relationship of infantile eclampsia and status lymphaticus has not been emphasized, but there is reason for believing that this convulsive neurosis, like glottic spasm, occurs in lymphatic children. In a few cases eclampsia and spasm of the glottis have been noted in the same infant in which status lymphaticus was disclosed at autopsy. As we shall see in the section following, tetany is one of the neuroses frequently combined with eclampsia and one in which status lymphaticus has been found to exist. It therefore appears quite proper, even in the absence of an abundance of direct evidence, to discuss the general convulsions of infancy in their present connection; and the writer is of the belief that more careful study from the point of view just indicated will show the correctness of this position. I have, during the last year, had the opportunity of performing an autopsy on a six months' infant dying of general convulsions, and found a large thymus with pronounced hyperplasia of the intestinal and splenic follicles, and hypertrophy of the mesenteric glands.

Idiopathic Tetany of Infancy.—Closely allied to spasm of the glottis and eclampsia is the carpopedal spasm of infancy which is, by most recent authors, classed as infantile idiopathic tetany. Tetany in infancy may manifest itself by carpopedal contractures alone, which occur in intermittent attacks or very rarely as a persistent spasm; it may exist as a latent affection, only showing under certain conditions of irritation; it occurs in combination with laryngeal spasm, or with laryngeal spasm and eclampsia. Its relations to rickets have been repeatedly pointed out, and discussions as to the invariable association of craniotabes and tetany and the causative influence of the former have frequently arisen. The association of tetany and status lymphaticus has been emphasized particularly by Eschereich, whose opportunities for the study of this and its allied neuroses have been especially good. He affirms that the lymphatic state may exist as a complication of tetany, and that it is of especially grave import. The various anomalies of status lymphaticus have been disclosed in autopsies on victims of tetany, although not always recognized in their proper connection.

Epilepsy.—A mention of persistent thymus in epilepsy was made in 1890 by Kruse and Cahen, based on their finding this anomaly in autopsies on two epileptics. The association of epilepsy with status lymphaticus has been particularly emphasized by the writer as the result of his studies in the Pathological Laboratory of the Ohio Hospital for Epileptics. In autopsies upon the victims of idiopathic grand mal, particularly in young and robust individuals, evidence of the lymphatic state occurs with a regularity that suggests more than an accidental relationship, though the tracing of a possible causal connection between epilepsy and status lymphaticus is at the present time largely a matter of speculation. I have already noted that a clinical kinship has been traced between epilepsy and the neuroses above mentioned, particularly infantile eclampsia and spasm of the glottis, and, as already suggested, these neuroses have been associated both with rickets and with the lymphatic state. As for epilepsy, no less an authority than Gowers has concluded from purely clinical and statistical observation that rickets must be looked to as a fundamental factor in the occurrence of teething fits and more remotely of the epilepsy which so frequently follows in a victim of infantile eclampsia. My studies in the morbid anatomy of epilepsy have revealed the evidence of an ancient rickets in

a proportion of cases, and the anomalies of status lymphaticus as a relatively constant occurrence in the subjects of idiopathic grand mal dying under circumstances favorable to the retention of the anomalies of the lymphatic state.

Epileptics are very prone to sudden and often tragic deaths, as by asphyxia (sometimes mechanical, sometimes not), "syncope," "heart failure" without anatomical cardiac lesions, rapid status epilepticus, oedema of the lungs, "cramps," and drowning, and I have endeavored to define an affinity between the sudden death in epilepsy and that seen in such neuroses as thymic asthma, the various forms of thymic sudden death of infancy, and those in adults presently to be described.

Death in Surgical Narcosis.—Gradually, but more particularly since the report upon Kundrat's observations, we are coming to learn that status lymphaticus is to be held responsible for most of the deaths in chloroform anaesthesia, and probably for many of those occurring in surgical narcosis by the use of other agents like ether, nitrous oxide, etc. Our information concerning chloroform sudden death is particularly definite because of the almost exclusive use of this drug in Austria and Germany, where, to the present time, thorough autopsies with the possibility of discovering the existence of status lymphaticus have alone been practised. Unquestionably when we come to make a careful anatomical analysis from the standpoint just indicated we shall find the conditions attending anaesthetic accidents in America identical with those recorded in Europe; though the impression now seems to prevail that chloroform *per se* is the especially dangerous anaesthetic in victims of the lymphatic state.

As to the time and mode of death no regularity has been determined. Any stage of anaesthesia from the first few whiffs to the completion, or during the period of recovery, or even several hours after the narcosis and operation have been ended, may be selected as the fatal moment. Death may be very abrupt with evidence of cardiac and respiratory failure, or the patient sinks more gradually with enfeebled pulse and shallow respiration. Methods of resuscitation, such as avail in the ordinary accidents of anaesthesia, are here fruitless.

For their protection in cases of the often distressing accidents of surgical narcosis it is important that the surgeon and anaesthetizer keep clearly in mind this now well-established association of status lymphaticus. Unfortunately, our means of ante-mortem diagnosis in status lymphaticus are at present quite unsatisfactory, particularly in the case of adults. In children the existence of adenoids, enlarged tonsils, enlarged superficial lymph nodes, and osseous rickety changes, together with a history showing eclampsia, laryngismus stridulus, or idiopathic tetany, should be seriously considered as having grave prognostic importance.

Death from Trivial Surgical and Medical Procedures.—Closely allied with the sudden death in surgical narcosis are those which occasionally follow minor operations. In some of these, especially those in which incomplete anaesthesia has been employed, it is questionable in how far the anaesthetic or the shock of the operation is to be held accountable for the fatal termination. Illustrations of this point are the deaths which have followed operations for the removal of nasopharyngeal adenoids. Here a partial anaesthesia is commonly employed, and most of the sudden deaths have been found under these conditions.

Although the point has not yet been prominently emphasized, I am personally inclined to the belief that careful study will reveal all the unexpected deaths following adenoid operations (including those on hypertrophied tonsils), either with or without anaesthesia, to be associated with status lymphaticus. It is at least pertinent to recall that the lymphatic overgrowth making the basis of nasopharyngeal adenoids and enlarged tonsils is one of the manifestations of status lymphaticus.

Allied to the accidents just alluded to are the deaths occurring in other minor operations done in incomplete

anæsthesia, and heretofore ascribed either to the anæsthetic alone or to the shock and drug effect combined. A well-known illustration is the occasional fatal accident during or after the extraction of a tooth. The occasional deaths after minor accidents, and following various trivial operations in which no anæsthetic is used, will doubtless gradually find their way into the group of neuroses associated with the lymphatic state.

A particularly appropriate illustration concerns the sudden deaths following the injection of curative sera, of which the first pronounced example was in the case of the young son of Professor Langerhans, of Berlin, who died suddenly a short time after the injection of a small dose of diphtheria antitoxin, used by his father for preventive purposes. At the time of the occurrence this case excited much discussion, and various theories were put forward to explain the accident, especial stress being laid upon the possible toxic effect of the antitoxin. However, the autopsy revealed certain evidences of status lymphaticus like swollen spleen with prominent follicles, enlarged tonsils and pharyngeal follicles, hyperplastic intestinal follicles, and slight rickety thickening of the costosternal margin; and while these were not taken into serious consideration during the immediate examination, they were dwelt upon later, and by such experienced students as Paltauf, Eschereich, and others, it was concluded that this unfortunate accident was one of the fatalities of the lymphatic state.

Eschereich reports the case of a lymphatic child who died in a salicylic-acid pack. Galatti records a similar fatality after an external application for eczema; the child developed tonic and clonic convulsions, and died in twenty-four hours, and here Kolisko found, along with the eczema, œdema of the brain, rachitis, and anæmia with evidence of lymphatism. In connection with his case Eschereich points out the danger of narcosis, prolonged hydrotherapeutic treatment, or weakening therapeutic measures in children with status lymphaticus.

Sudden Death in Adults, and Death in the Water.—Abundant evidence has accumulated to show that adults, especially young, apparently strong individuals, are, like infants and children, the subjects of status lymphaticus and therefore exposed to such accidents as sudden death under the various circumstances just related, as that in surgical narcosis and after trivial operations. Death in the water by so-called "drowning" is one of the modes noted more particularly in adults, though mentioned in the case of some infants. In some of these fatal accidents the victims have been found dead with no external evidence to indicate the mode of termination. Others have died before spectators by a variety of tragic methods. A number have expired in the water with so-called "cramps" or by "drowning," in which the usual post-mortem findings of fatal immersion were absent. Most of these occurrences have demanded medico-legal investigations, and their importance from this standpoint is so great that it seems desirable to illustrate the subject by citing some typical cases.

Nordmann describes the case of a twenty-six-year-old scavenger, in apparent good health, who was found dead in the situation of his work. Autopsy showed the body of a medium-sized, strongly developed man, with diffusely echymotic skin; tonsils and papillæ of the tongue prominent; lungs congested and moist; heart echymotic; flesh somewhat thickened, tough, and pale; liver and kidneys dark and hard; thymus persistent and enlarged, measuring $7 \times 5 \times 1.5$ cm.; lymph glands in neck, axilla, and mesentery much enlarged and pale; aorta narrow (5.5 cm. above valve), wall thin and smooth.

Another case, noted by Nordmann, is that of a twenty-five-year-old man who died suddenly without assignable cause while playing cards with several companions. Section (by Kaufmann) revealed a thymus gland, thin, but as large as the palm of the hand; general hyperæmia; flaccid, slightly dilated heart, and slight enlargement of lymphatic glands and follicles.

Still another case recorded by Nordmann illustrates a form of sudden death after bathing. A soldier in good

physical condition, twenty-six years old, went bathing on a warm August afternoon with a number of comrades. All precautions were taken as to the proper temperature of the water. He entered the water slowly, swam about for two or three minutes, and returned to the shore. After emerging from the water he complained of chilliness, suddenly stiffened his extremities, became pale, turned his eyes upward, and with a long-drawn inspiration fell to the ground. He was assisted to a sitting posture, where Nordmann found him pulseless, with a deeply cyanosed face, and after two or three spontaneous attempts at breathing respiration ceased. Artificial respiration and stimulation were of no avail. On autopsy the body was found to be well formed, in good nutrition, with pronounced rigor, and cyanosis of the face. The brain was merely congested. The thoracic organs were entirely normal. Bronchial glands were somewhat enlarged, gray-black, and a little firmer than usual. A thymus gland, larger than a fist, lay in the anterior mediastinum, dark red in color, with follicles plainly visible. The tonsils were enlarged, as were also the lymph glands, and the follicles of the tongue and spleen. The thyroid was symmetrically enlarged.

Several instances have been reported in which people in apparently good health suddenly fell into the water, and, although at once removed, before death by asphyxia could possibly have occurred, could not be resuscitated. A thirteen-year-old boy fell unexpectedly from on board a ship in the docks, and although immediately removed from the water, could not be revived. The autopsy was conducted by von Recklinghausen, who reports, aside from an enlarged thymus, enlarged tonsils and lymph glands, nothing abnormal. Another case noted by von Recklinghausen is that of a man, twenty-seven years old, who, while bathing in a forbidden spot, was suddenly accosted. He arose from the water frightened, and at once fell, to sink below the surface. He was promptly dragged from the water, but did not revive. Section of the body of this large, lean, well-formed man showed a general hyperæmia; flaccid, dilated heart, with a tough myocardium and normal valves; and slight narrowing of the ascending aorta. The lymph glands in the neck, axilla, mesentery, and the tonsils were enlarged and pale; the follicles of the spleen, tongue, and epiglottis were swollen (intestinal follicles not mentioned). In the anterior mediastinum a persistent thymus measuring $9 \times 6 \times 1.5$ cm. was discovered.

At least two well-authenticated examples of thymic and lymphatic hyperplasia in individuals sinking suddenly while swimming are described by Nordmann in his excellent paper upon the relation of the thymus gland to sudden death in the water. These two cases Nordmann credits to von Recklinghausen. A twenty-year-old mechanic, while swimming, uttered a sharp cry and sank beneath the surface, and, though promptly removed from the water, was dead. On post-mortem examination his body was found to be lean; the organs were generally congested; the lymphatic glands in the neck, axilla, and groin were enlarged, along with the spleen. The follicles in the nose, glottis, and tongue were very prominent. The thymus was persistent and measured $10 \times 6 \times 1$ cm. In the other case a man twenty-eight years of age suddenly sank while swimming beside some companions. He was at once removed from the water, but death had already taken place. The body was well nourished. The noticeable features of the section were the enlarged tonsils, lymph glands, and spleen; and the hyperplastic follicles of the tongue, spleen, and intestines (Peyer's patches). The heart was flaccid, and the aorta measured but 4 cm. at its origin. The thyroid was enlarged. The persistent thymus was $10 \times 8 \times 1$ cm. in size.

Lower Resistance to Infection.—A predominant peculiarity of the constitutional condition which we are considering is, as Paltauf and others have shown, a lowered vital resistance, and this is apparent in the event of certain acute infections. Diphtheria, as demonstrated in Eschereich's clinic by Moriz Daut, tends to assume a particularly severe type and to prove frequently fatal in

lymphatic infants and children. Between the years 1890 and 1897 there were seventy-nine deaths from diphtheria in the clinic at Graz, and twenty-three of these showed status lymphaticus. Susceptibility to diphtheria in lymphatic children shows itself in several ways. Thus in the midst of an otherwise mild epidemic the lymphatic victims may die early in the attack with no diphtheritic anatomical lesions to explain the unexpected ending. There are hoarseness of the voice, hoarse cough, and a tendency to suffocation. Only a thin false membrane is present in the throat and larynx, and nowhere is there a mechanical obstacle to explain the hoarseness and dyspnoic symptoms. One or two days after entering the hospital the children become much worse; after coughing, severe dyspnoea and cyanosis appear with a small, weak, irregular pulse; consciousness is lost, and death supervenes in spite of various heroic efforts at resuscitation, including intubation or tracheotomy. In another class of cases there is a pronounced tendency to rapid extension of the diphtheritic exudate into the bronchi and bronchioles with bronchopneumonia following. Here, of course, the anatomical findings fully explain the fatal termination. This also holds true for the septic type of cases with early death; but the point is made that subjects of status lymphaticus are, from their constitutional weakness, especially prone to suffer severely from this infection. All the ordinary therapeutic efforts for diphtheria fail in these cases, and such is likewise the case with the extraordinary measures like tracheotomy and intubation. It is here also that the specific serum, the antitoxin of diphtheria, fails to exert its usually prompt and beneficial results. Even in early cases in which antitoxin usually produces a marvellous effect, none follows, and this seems to be independent of the dosage, for Daut, in his cases, used the antitoxin promptly and freely. It is very desirable for physicians generally to be clearly informed as to the unfavorable prognosis of diphtheria in status lymphaticus, and especially as to the possibility of failure with that sovereign remedy—antitoxin—in this class of individuals. Alike is the danger of accidents following the use of a prophylactic antitoxin injection, and, in the absence of the specific therapeutic response to the remedy, it behooves the practitioner to be on his guard both for his own protection and to spare ill repute to so valuable a therapeutic agent as the antitoxin of diphtheria. We have had, at the Ohio Hospital for Epileptics, three cases of fatal diphtheria in adult epileptics in which we ascribed the unexpected termination to the existence of a status lymphaticus as demonstrated at autopsy. In each of these cases antitoxin treatment was unavailing.

Among other infectious diseases toward which the resistance of lymphatic subjects is lowered may be mentioned cholera as shown by Virchow, pneumonia by Ortner, typhoid fever by Fraentzel, Virchow, and Hiller. Ortner found pronounced evidence of status lymphaticus in some fatal cases of anæmia after removal of the exciting cause, Bothrioccephalus latus, and he holds the connection to be more than a coincidence. In most of the cases just mentioned the especially prominent anomaly was the hypoplasia of the heart and arteries, the cases being, in fact, examples of Virchow's "lymphatic chlorotic constitution."

Bronchial Cough.—West has reported several cases in which a harsh, spasmodic, croupy cough was assigned to the irritation of enlarged bronchial lymph nodes and which improved under the administration of creosote. The enlarged and offending glands were looked upon as manifestations of lymphatism, of which the patients exhibited certain other clinical manifestations like enlarged superficial lymph glands, hypertrophied tonsils, palpable spleen, dullness over the upper sternum, and, in half of the cases, evidences of a previous rachitis.

ASSOCIATION WITH OTHER DISEASES.—As has already been stated, hypertrophy of the thyroid, *i.e.*, goitre, has been found in about one-half of the cases of status lymphaticus in adults. This may be simple goitre or it may take the form of exophthalmic goitre. Möbius, in 1891,

emphasized the concurrence of persistent thymus and Basedow's disease, and this has been verified by Mosler, Spencer, Johnston, White, Ross, Bradford, Hektoen, and a number of others. Several of these cases died abruptly under circumstances strongly suggestive of thymic sudden death as now recognized, and in the several thorough autopsies, besides the persistent and hyperplastic thymus, such lymphatic alterations as prominent intestinal and splenic follicles, etc., have been described. In explanation of this syndrome it is urged that experimental evidence points to some sympathetic relation between the thyroid and thymus as shown by the enlargement of one following the extirpation of the other. It is also suggested that the tachycardia of exophthalmic goitre is analogous with the tendency to cardiac paralysis in status lymphaticus.

As long since shown by Virchow, hypoplasia of the heart and arteries is frequently associated with chlorosis, and Copeland and Bamberger noted the coincidence of hæmophilia with aortic narrowing. It has also been found that other features of the lymphatic state are associated with the hypoplasia of the heart and arteries, and this, recognized by Virchow, led him to define the condition as the "lymphatic-chlorotic" constitution.

The extensive hyperplasia of lymphadenoid tissue in status lymphaticus brings it anatomically to resemble some cases of leukæmia and pseudoleukæmia. In the latter conditions we not only encounter enlargement of the lymph glands and lymph follicles, but hypertrophy or lymphoid overgrowth of the thymus as well. There seems, however, to be little or no clinical analogy between these affections. The blood changes, like the anæmia, and the disturbance of balance in the various kinds of leucocytes are either entirely absent in status lymphaticus or but imperfectly exhibited by occasional lymphocytosis. Ewing has shown that while the enlargement of the intestinal follicles may reach the extent observed in less pronounced pseudoleukæmia, in the latter disease the small nodules of lymphoid tissue grow laterally for some distance before producing much elevation of the mucosa, contrasting with the sharply circumscribed, abruptly projecting follicles of status lymphaticus. The nodules of pseudoleukæmia frequently ulcerate at their central points owing to improper blood supply, here again differing from the well-vascularized follicles of lymphatism. Ewing remarks: "In the majority of the cases of lymphatic constitution the enlargement of the lymph nodes does not pass beyond the limits of what may be called a physiological hypertrophy, and bears little resemblance to a tumor formation. The spleen is rarely much enlarged. The presence of considerable pigment in the spleen pulp is too ordinarily seen to be interpreted positively as the result of an excessive blood destruction, such as characterizes the severe anæmias. Yet it must be admitted that the very considerable degree of pigment deposit reached by the two cases referred to above* indicates that in some instances the blood has suffered severely. These children are, however, not usually anæmic, but in excellent health, and even the sickliest of them do not resemble cases of infantile leukæmia, pseudoleukæmia (von Jaksch), or chlorosis. As for the hyperplasia of the lymphoid marrow, it may be said that the normal limits of lymphoid marrow are as yet by no means definitely settled. Such hyperplasia may be seen also in the secondary anæmias, and in any case the hyperplasia of the lymphoid marrow may be regarded as merely a part of the general and more or less physiological hypertrophy of the lymphoid structures of the body."

DIAGNOSIS.—Paltauf distinguishes two varieties of status lymphaticus, one rachitic, the other non-rachitic. In the first group a pale skin, well-developed fat layer, enlarged spleen and thymus, with lymph glands and follicles in varying grades of enlargement, and the epiphyseal changes of rickets are prominent; while in the second the pale skin, rich fat layer, and pronounced hyperplasia

* Cases reported by Ewing.