

experienced. So strong is the sense of fatigue, and it may be pain in the arm, that rest is often taken; the arm is steadied, and the pen is seized with a firmer grip. Other muscles are called into action, and great efforts are made to relieve the fatigued muscles by writing with the whole arm. The writing changes its character and becomes irregular; the muscles of the first three fingers, after a time, are given to fibrillary trembling. Finally writing becomes impossible; the pen is taken up, a strong effort of the will tries to force the muscles to the task, but they obstinately refuse to execute the necessary movements. In a perfectly normal state, writing is so constantly and for such a long period carried on, that the supervision of the higher centers over the muscular movements ceases to be exercised: in other words, the act of writing becomes largely automatic. When such a muscular disability occurs, the attention must be again directed to the act, and then a new element of discord is introduced. Besides fibrillary trembling, a condition of tonic spasm seizes the muscles of the thumb and the flexors of the fingers. These involuntary contractions or spasms of the muscles sometimes also involve the extensors, and thus a condition of *ataxia* results. There is still another group of cases in which a marked paresis or weakness of the flexors of the thumb and fingers takes place, and fibrillary trembling frequently coincides with the weakness. This group is called the *paralytic* form. There is still another group in which the flexors and extensors are occupied by cramps, there is no trembling, no sense of fatigue, and the sensibility is intact. In the paralytic group the electro-sensibility and the electro-contraction are reduced; in the spasmodic group, the electro-sensibility and contraction are either exaggerated or normal.

**Course, Duration, and Termination.**—The course of writer's cramp is very chronic and the duration indefinite. It is more often than is supposed the precursor of more serious ailments of the nervous system. If, with the first symptoms, entire rest be given to the affected member, a cure may be readily effected; but, when the disability is complete, the prognosis as to cure is very gloomy. If it be true, as the author's observation has led him to conclude, that writer's cramp is often followed by other nervous diseases, no case is without importance, and the management should include instructions as to manner of life and regimen, to avoid future complications.

**Treatment.**—As soon as the symptoms of writer's cramp become manifest, writing should be relinquished immediately, and the muscles be given rest for several months. Rest may remove all the symptoms, and subsequently moderation in the amount of writing and giving sufficient intervals of rest will entirely obviate the tendency to cramp or paresis. Much attention should be given to the position of the fingers, and to the amount of effort necessary. A large pen-holder

and an easy, unembarrassed manner of grasping the pen are of much importance. When the case is complete, and writing becomes impossible, a cure is not to be hoped for; but such amelioration may be effected as to permit a very little daily use of the hand in writing. There are two local remedies of real value—galvanism and massage. A current from ten to fifteen of Siemens and Halske's elements should be passed daily for a few minutes through the affected muscles. If spasm and fatigue are the conditions of the muscles, a stable current is to be preferred; if the muscles are weak, a labile current should be used. The forearm, the muscles of the thumb, and the interossei should be gently rubbed and kneaded for a few minutes previously to the application of electricity. If the general health is depressed, good effects are obtained from strychnine; but this agent does harm if the nervous system is excitable and the circulation active. The phosphates, quinine, and cod-liver oil, should be prescribed if the health is poor.

#### TETANUS.

**Definition.**—By *tetanus* is meant a disease characterized by paroxysmal tonic contractions of the voluntary muscles, and due to an exaltation of the reflex function of the spinal cord.

**Causes.**—Tetanus may be produced by intrinsic or central lesions and extrinsic or peripheral lesions. The latter are more important than the former. As the best example of a tetanic condition due to centric causes may be mentioned the action of those agents which increase the reflex excitability of the spinal cord, namely, strychnia, brucia, and thebaia. The extrinsic causes are wounds and injuries of various kinds, especially those involving nerves, many of which are insignificant—for example, the prick of a needle, the extraction of a tooth, perforating the ears for ear-rings, or bleeding—each of which has caused tetanus. Internal traumatic injuries may produce the same result. Tetanus has followed parturition and uterine diseases; and the so-called idiopathic tetanus has supervened upon inflammatory exudations, involving the pneumogastric or phrenic nerves. The severity of the injury bears no relation to the frequency or violence of the attacks. When a wound is cicatrizing, tetanus is more apt to occur, especially if the cicatrix is so situated as to compress a nerve. The situation of a wound has more influence—those of the extremities having the greatest effect. *Trismus neonatorum*, tetanus of the newborn, occurs usually from the fifth to the twelfth day, and is attributed to section of the funis and a subsequent inflammation. Tetanus also succeeds to circumcision. Much influence is ascribed to cold by some writers. It is probably true that wounded men, exposed to cold, are more liable to the disease. The free use of cold water as a dressing for wounds, during the rebellion, was responsible for many cases, it is

supposed by competent judges. On the other hand, tetanus is a common malady in tropical countries.

**Pathological Anatomy.**—The changes occurring in tetanus are found in various parts of the cord, but chiefly in the medulla oblongata, in the lumbar region, in the gray substance around the central canal, and in the anterior horns. Very considerable dilatation of the vessels is always found. Exudation of a semi-fluid, colloid substance, hyperplasia of the neuroglia, and abundant nuclear proliferation in the gray matter, have been observed in the more recent microscopical investigations.

**Symptoms.**—The onset of the disease varies according to the cause. When due to a wound, there are changes in its character as the disease is about to develop: the cicatrization ceases, the suppuration presents a different aspect, the wound becomes irritable, tender, and red, and pains shoot along toward the body. When caused by cold, there is chilliness, followed by fever, and stiffness of the neck is felt. The first manifestation of the tetanic paroxysm is, in a great majority of cases, in the motor branches of the fifth, which innervate the masseters and internal pterygoids, and the jaws are set in a condition of rigidity. To this tetanic fixation of the jaw is applied the term *trismus*. The attempt to swallow excites cramp of the pharynx, and is therefore difficult and painful. Next, the post-cervical muscles become rigid, and the head is held back. The muscles of the face now take a fixed position, the lips are retracted, exposing the teeth; the brow is corrugated, giving to the countenance a mixed expression of anguish and laughter—the *risus sardonicus*. The muscular rigidity now extends to the trunk and extremities, and hence the whole body, while helpless, is immovable and rigid. As the spinal muscles are more tense and more powerfully acted on, the body is bent, and may rest only on the occiput and heels. This position is entitled *opisthotonos*. Less frequently, the body is bent in the opposite direction, or forward—a position known as *emprosthotonos*. Still more rarely the inclination is lateral, or *pleurosthotonos*. The condition of excitation is not the same all along the spinal canal, for we find that the flexors of the upper and the extensors of the lower extremities are comparatively more active. In the beginning of the attack, the rigidity is not constant, does not affect all the muscles equally, and may pass from one to another group. There are remissions also at first, during which there may be complete relaxation. But the paroxysms become more frequent and severe, and are presently excited by the slightest movement. So exquisitely excitable is the reflex faculty, that the least possible peripheral impression brings on a spasm—a mere touch, a current of air, the reflection from a mirror or surface of water, will excite it. At the moment of the spasm a sudden tonic contraction seizes all of the voluntary muscles, the face is horribly distorted, the spine is bent,

the body resting on the head and heels, the abdomen retracted, respiration suspended, the feet incurved and extended, the hands violently clinched and drawn in with the forearms toward the body. During the convulsion a severe pain is felt at the epigastrium, and extends through to the back. The muscles so violently acted on are very painful, and even rupture of fibers, sometimes of a muscle, may take place. The paroxysm soon reaches its maximum and then subsides, and during the interval between them the patient breathes more easily, and is able to swallow a little. The frequency with which the paroxysms come on, their violence and duration, furnish the measure of the importance of the case. Some sleep may be obtained in the interval between the paroxysms, but on awaking the attacks of spasm are resumed, and in severe cases sleep is entirely prevented. Meanwhile, the mental powers are unimpaired, and sensibility and the special senses remain normal. In a few instances diminution of sensibility has been noted. As muscular activity is a great source of animal heat, it is not surprising that in this disease there should be rise of temperature. The fever does not pursue any special type, but at death it may attain to 104° or 105° Fahr., and rise even higher for an hour or two after death. Profuse sweats also occur. Respiration during the spasms is carried on by the diaphragm only, and the pulse becomes hard and very rapid. The voice is harsh, guttural, and sometimes speech is unintelligible. The mouth is dry, the saliva viscid, deglutition almost impossible, and constipation is the rule. The urine is normal, or scanty, usually alkaline, and sometimes contains sugar.

**Course, Duration, and Termination.**—The course of tetanus may be very acute, or more protracted, when it is known as chronic tetanus. In the acute form an early termination is caused by tetanic fixation of the muscles of respiration. In the chronic form the intervals between the paroxysms are longer; the patient has an opportunity to obtain some sleep and to take food. In the tetanus of the new-born, and in toxic tetanus, the duration is shorter than in the traumatic, the paroxysms succeed each other rapidly, and death occurs in asphyxia. Idiopathic tetanus is not so violent, as a rule, and the prognosis is hence more favorable. Traumatic tetanus is always serious, but the case may be regarded as more favorable when the intervals between the paroxysms are long enough to permit sleep and alimentation, and the paroxysms are less dangerous to respiration. The case is still more favorable if, after the second day, there is no increase in the number and severity of the paroxysms.

**Diagnosis.**—Tetanus is distinguished from strychnine-poisoning by the sudden onset and quick termination of the latter, and by the presence of a wound or some other cause of the seizure. In spinal meningitis there are tonic spasms of the muscles, but the rigidity is not

paroxysmal, and there are no intervals of entire cessation of the morbid action; there is not the great reflex excitability of tetanus and the occurrence of cramps on slight irritation peculiar to that disease, and in spinal meningitis the tonic rigidity is succeeded by paralysis. Hydrophobia is very similar to tetanus, but it develops more slowly; there is a special antipathy to water and inability to take it when other articles may be swallowed, and a peculiar hawking noise is made, to dislodge a little viscid secretion from the throat, peculiar to this disease. Trismus may be limited to the muscles of mastication, and may be produced by colds and exposure, but it is confined to these muscles and does not become generalized. Those cases occurring in the course of cerebral disease are also diagnosticated by the symptoms of such diseases, which have no relation to tetanus.

**Treatment.**—Whenever an obvious cause exists it must be removed. If a wound, splinters of bone and foreign bodies should be searched for; if a cicatrix, it should be dissected out; if an injured nerve, it should be divided. The remedies which have been most successful are those which diminish the reflex function of the spinal cord. Bromide of potassium seems to have been the most successful agent thus far employed. It must be given in very large doses—from one to two drachms every four hours, until the spasms are decidedly diminished, when the quantity may be somewhat reduced. Given early, and the effect maintained until the spasms cease, it must be regarded as the best remedy in view of the large proportion of cures. Next to the bromide is curara, which acts on the end-organs of the nerves and on the reflex faculty. This must be given hypodermatically, and the effect produced must be the guide. As curara is a very uncertain substance in its composition, the dose necessary can only be determined by trial, but, inasmuch as one eighth of a grain has been administered at a dose, it will be prudent to commence with one fortieth of a grain, and increase it until some effect on the spasms has been caused. Nicotine has similar properties and powers, and has been used hypodermatically in tetanus and in strychnine-poisoning with success. The author has seen a very severe case of traumatic tetanus treated successfully with the wine of tobacco. Physostigma and eserine have been now employed in a large number of cases and with excellent results. Eserine can be given subcutaneously, beginning at one sixtieth of a grain and increasing it until some effect is produced on the spasms. Cannabis Indica has also arrested some cases of tetanus, and is a very promising remedy. Recently urethane has been proved to have the most complete antagonism to strychnine, and is strongly recommended as a remedy for tetanus. The spinal ice-bag and the continuous current have proved palliative. Warm baths and the vapor-bath have given comfort, and have exerted a temporary influence over the spasms. An estimate of the value of a remedy is much affected by the period at which it is administered, for the longer the case has

lasted the more hopeful. The nutrition of cases of tetanus is highly important, and from the beginning they should be carefully fed. Noises and excitement, every form of peripheric irritation, and emotion of all kinds, should be excluded. As there is strong temptation to use ether and chloroform freely because of the relief they afford, the author desires to caution his readers, because of the injury so often done by them.

## DISEASES OF THE PERIPHERAL NERVES.

### NEURITIS.

**Definition.**—The word *neuritis* signifies inflammation of a nerve, but there are several distinctive maladies which may be grouped under this designation. There is a simple neuritis, in which one or more nerves may be affected by some local cause, usually trauma, and this may be either an *acute* or *chronic* inflammation. *Toxic neuritis* is that form of the disease induced by some poison introduced from without, as lead, copper, arsenic, etc. *Diathetic neuritis* arises from some systemic condition, such as rheumatism, gout, syphilis, etc., or it is due to the blood changes in typhoid, diphtheria, scarlet fever, and similar diseases. Again, neuritis, in consequence of conditions not well understood, manifests a tendency to spread from its point of origin and involve many other nerve trunks, whence we have *ascending neuritis*, *multiple neuritis*, and *progressive multiple neuritis*.

**Causes.**—The influences affecting the inflamed nerves are necessarily various. Simple neuritis is produced by wounds, injuries, and by the transference of the morbid action from a neighboring inflamed tissue. Thus, intercostal neuritis is caused by an adjacent pleuritis, or tuberculosis of the lung; sciatica, by a pelvic abscess or inflamed hæmorrhoids; and caries of bone may involve a nerve or plexus of nerves in the vicinity. As neuritis may occur in various nerve trunks simultaneously, and without apparent cause, there is, probably, a peculiar type of nervous system in which such an action is prone to take place. It is probable, also, that the occurrence of neuritis, in cases of fever and septic diseases, is due to the constitutional type of the affected individual, for such an accident is quite unusual. The special causes which originate and maintain progressive multiple neuritis are quite unknown.

**Pathological Anatomy.**—The first step in the process is hyperæmia: exudation takes place into the nerve, which becomes softened and ultimately breaks down into a diffuent mass. Migration of white corpuscles takes place into the neurilemma, an exudation partly serous, partly fibrinous, and minute extravasations occur between the fasciculi,