lutely no changes were found at the autopsy, although the course of the disease seemed in every way to suggest an acute lesion. These patients were for the most part young, and up to the time of their illness vigorous persons. After a short prodromal stage, in which there were headache and some fever, they were attacked by a flaccid paralysis of both legs, which developed in a few days. To this was added in a very short while paresis of both arms, so that the helplessness of the patients reached an unusual degree. The condition of the reflexes and the electrical excitability varied in the few cases reported up till now. According to the records, the functions of the bladder and rectum as well as sensibility remained normal. The prognosis is very doubtful. Sometimes bulbar symptoms appear, and the patient dies within from eight to fourteen days after the onset. Sometimes the course is more protracted and some improvement occurs, which, however, is never complete. The affection which presents the clinical picture just described is called Landry's paralysis (1859), *paralysie ascendante aiguë*, acute ascending spinal paralysis, although it is not definitely known whether we actually have to deal with a spinal affection and not rather with a very acute infectious peripheral neuritis. Until we possess the results of a larger number of anatomical examinations it is of no use to theorize any more about the nature of the disease (cf. Schultze, Schwarz, Bernhardt, von Recklinghausen, and Klebs (who found hyaline thromboses), Münch. med. Wochenschr., 1890, 52, pp. 923 *et seq.*).

With regard to the ætiology of Landry's paralysis, about which so little is known, it is possible that it may be caused by infectious diseases, for instance, by whooping-cough (Möbius). Of great interest is the communication of Curschmann (Verhandl. des fünften Congresses für innere Med., Wiesbaden, 1886, p. 469), in which he speaks of a case of acute ascending paralysis where at the autopsy typhoid bacilli were found in the spinal cord. It may also develop in the course of pernicious anæmia (cf. also Minnich, Zeitschr. f. klin. Med., 1892, xxi, 1, 2).

The symptomatology, diagnosis, and treatment of acute myelitis have been discussed on pages 450 to 456.

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B. The Chronic Form.

Chronic myelitis is much more commonly observed than the acute form. It is characterized by the death of the nerve elements and a consequent increase of the supporting elements, which gives to the tissue a peculiar firm appearance and consistence—sclerosis. That this sclerosis is frequently confined to certain nerve tracts, giving rise to the so-called "system-diseases," we have pointed out above on page 440. On page 451 will be found some account of the sensory, motor, and trophic changes which are found in these affections. It is in all cases of great importance to look to the condition of the reflexes, as this may have a decisive significance for the diagnosis. The disturbances of the bladder and rectum in chronic myelitis and the treatment of the disease have been discussed above.

III. Spinal Tumors.

Pathological Anatomy.—In the spinal cord, just as in the brain, the glioma is relatively the most frequent form of primary neoplasm. What has been said on page 289 about its development holds good here also. The cervical and dorsal part of the cord seem by preference to be the seat of the glioma. Sarcomata, which from the onset present a sarcomatous nature, and gliosarcomata—that is, gliomata with unusually

marked proliferation of cells—have been observed, although but rarely as primary tumors. Angiomata, small reddish, probably congenital (Virchow) foci, have been found, and Ganguillet has observed a cylindroma in the lowest portion of the spinal cord. Solitary tubercles and syphilomata are much rarer here than in the brain. Carcinomata usually start from the vertebræ and afterward spread to the spinal meninges. The secondary changes are, of course, not nearly so well marked here as those found in the brain, since the spinal cord is in a position to offer greater resistance to the growth that presses upon it. Only when the tumor has reached some considerable size—e. g., that of a hazel-nut—do symptoms analogous to the so-called "indirect symptoms" in the brain make their appearance.

Ætiology.—The ætiology is absolutely unknown. Though in certain cases traumatism has been made responsible for gliomata in the spinal cord, we are still in complete ignorance about the real cause, as we confessed ourselves to be when treating of their occurrence in the brain. The influence of age and sex here is the same as in tumors of the brain.

Symptoms.—If a patient complains of persistent pains and stiffness in his back, if at the same time there are found sensory disturbances in the form of paræsthesias, circumscribed areas of anæsthesia, and motor disturbances in the form of slowly but steadily progressing paralysis of one or more extremities, the suspicion that a tumor of the meninges or of the cord itself exists, is justifiable. The likelihood is greater if other spinal affections can be excluded and if occasional remissions in the progress of the disease can be noted. It is true the diagnosis of spinal tumors always remains a very difficult thing, and at times, for instance, we may not be able to definitely differentiate a myelitis from a spinal tumor. This is easily understood if we consider that spinal tumors may give rise to the most varied clinical pictures, according to their position and size and according to the greater or lesser involvement of the white or gray matter. There is no doubt but that a tumor of the spinal cord may give rise to symptoms of a compression myelitis, of tabes, or of a myelitis, and that if it be confined to one side it may produce the symptoms of a Brown-Séquard paralysis. Roth (cf. lit.) claims that loss of the temperature sense is frequently observed in spinal glioma, and that this, combined with analgesia, paresis, and muscular atrophy,

is sufficient to settle the diagnosis. The considerable material which Roth has at his disposal makes his monograph very valuable. It is only to be expected that vaso-motor as well as trophic symptoms should be found. To interpret these must be left to the physician's skill in diagnosis, upon which so much depends in the recognition of tumors of the cord. Sudden changes in the spinal symptoms, temporary remissions, then again sudden changes for the worse, should all be made to have their proper diagnostic value. In cases of well-marked paraplegia dolorosa, where we have tearing pains in the small of the back, radiating into the extremities, together with atrophy of the muscles of the lower legs, we should always think of one or several tumors of the cauda equina. In these cases contractures of such severity sometimes develop that the heels touch the buttocks (Leyden).

Prognosis.—The prognosis depends upon the nature and the seat of the tumor, although the ultimate outcome is always unfavorable. If the growth be benign and be situated in a relatively indifferent area, the patient may last for years, and even enjoy periods so free from discomfort that he may deem a recovery quite possible.

Treatment.—The treatment can only be of any avail if surgical interference—that is, excision of the tumor—is possible. A case of this character has been reported by Gowers and Horsley. An oval myxoma which had pressed upon the cord was, after removal of the spinous processes of the third, fourth, and fifth dorsal vertebræ, excised, and the patient recovered completely. Bruce and Mott (cf. lit.) diagnosticated *intra vitam* a tumor which, originating in the fifth left dorsal nerve, pressed upon the middle of the dorsal part of the spinal cord; the patient presented the symptoms of a compression myelitis and died. At the autopsy softening with ascending and descending degeneration was found. The authors regret in their paper not having decided upon an extirpation of the tumor.

All other means are fruitless. If there is any suspicion that the case is one of syphilis, inunctions with mercury ought to be given a trial.

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APPENDIX.—PARASITES IN THE SPINAL CORD.

About parasites in the spinal cord we may look in vain for information in the text-books, probably because their occurrence is very unusual, and also because, if they are present, they may not give rise to any symptoms. But here we ought to make at least brief mention of the cysticerci which have been found not only in the brain, but also in the spinal cord. Leyden devotes only a few words to this subject in his Klinik der Rückenmarkskrankheiten (1, 445): "Still more rare [than the cysticerci in the brain], and as yet of no clinical significance whatever, are the cysticerci which may develop . . . in the adnexa of the spinal cord, etc." I have shown in a case which came to my notice, and which I have reported (cf. lit.), that cysticerci of the spinal cord—there were fifteen or twenty in the dural sac—may give rise to symptoms simulating those of tabes; some clinical significance has, therefore, to be attributed to them. That the symptoms of spinal irritation, which are associated with such parasites in the cord, are not to be attributed to the increased intraspinal pressure, but that they are of a reflex nature, seems beyond doubt. To diagnosticate *intra vitam* the existence of intraspinal parasites is only possible in exceptional cases, as, for instance, if the patient is a butcher by trade, or if his frequent indulgence in raw meat gives rise to the suspicion of cysticerci; but even in the most favorable cases the diagnosis can not claim to be more than conjectural.

Almost as rarely do we find echinococci in the vertebral canal. A case of this nature, however, which is of a great deal of interest, has been published by Jaenicke (cf. lit.). An echinococcus, which had existed in the subpleural tissue in the region between the ninth and the twelfth dorsal vertebra, penetrated into the vertebral canal, and, owing to the compression thus exerted upon the spinal cord, gave rise to such characteristic symptoms that the diagnosis *intra vitam* was to a certain degree justifiable. More recently Friedeberg has reported a case of this kind in the Centralbl. f. klin. Med., 1893, xiv, 51.

IV. Congenital Diseases—Hydrorrhachis—Spina Bifida.

To a collection of fluid in the skull we have given the name hydrocephalus (page 308); similarly a like collection in the vertebral canal we call hydrorrhachis, and specify two forms of the disease—the hydrorrhachis externa and interna—according as the fluid is situated in the meshes of the pia or between the meninges, or, on the other hand, in the interior of the spinal cord. In the latter case we find a dilatation of the central canal, which is either uniform throughout or beaded.

At the autopsy we not rarely, instead of the normal central canal, the ordinary diameter of which measures from one tenth to one millimetre, find a canal with a diameter of two, five, or even ten millimetres ("hydromyelia"), or alongside of the usual canal abnormal cavity formations ("syringomyelia"); during life, on the other hand, such conditions are by no means often correctly recognized. The practical significance of these abnormities is not great, as, for one thing, the signs during life are so uncertain and changeable that a correct diagnosis has almost to be regarded as accidental, and, secondly, because the disease, even if recognized, is not at all accessible to any treatment. Notwithstanding this, it is of course desirable that the present state of our knowledge of hydromyelia and syringomyelia should be given briefly here.

With reference to the origin of hydromyelia, it is more especially abnormities in development which we have to deal with, and rarely does the influence of pressure—e. g., a tumor in the posterior fossa of the skull—come in. For the development of syringomyelia, central gliosis, with secondary disintegration and cavity formation, is said to play an important part (Fr. Schultze). It has recently been doubted that congenital developmental anomalies (Leyden, Kahler and Pick, Strümpell, and others) are necessary for the occurrence of the alteration. Rosenbach and Schtscherback (Virchow's Arch., 1890, cxxii, Heft 1) have shown experimentally that cavities may develop in compression myelitis as a result of direct or indirect pressure. These cavities may connect with the fourth ventricle, and extend through the medulla oblongata as far as the conus terminalis, and in a cross-section two or more lumina may be seen. They are of variable lengths, and are, as a rule, situated in the lower cervical, in the dorsal cord, and especially in close proximity to the central canal, sometimes also in the posterior

horns. Their width varies from a half to ten millimetres; their contents are sometimes watery and thin, sometimes milky and viscid. The relation of the central canal to these cavities varies so much that no rule can be given on this point. In certain instances it remains intact in its whole length.

The clinical symptoms which are observed in syringomyelia were first described by Morvan in 1883 under the term of parésie analgésique à panaris; hence the condition is sometimes called Morvan's disease.

There are, more especially, three symptoms which should arouse a suspicion of syringomyelia, namely, (1) localized muscular atrophies, more especially in the upper extremities; (2) a widespread, non-typical hemianæsthesia (especially analgesia); and (3) trophic disturbances of the skin and deeper parts (whitlow, phlegmon), also of the bones and joints, the former breaking more easily, the latter showing a widening of the capsular space, and being covered with villi of varying size and consistence which are more or less hyperæmic (Ssokolow, Nissen, cf. lit.). Extensive neuropathic destructions of bones and joints, which occur in consequence of the analgesia, are met with (Karg). The muscular atrophy of the upper extremities is always associated with more or less pronounced paralysis, as we might expect in lesions of the anterior gray horns. In such instances amyotrophic lateral sclerosis or peripheral neuritis may suggest itself as a diagnosis. The sensory changes are readily explained by the fact that the posterior commissure, Goll's columns, and the posterior horns are preferably the seat of the affection. In one of Schüppel's cases (Arch. d. Heilk., 1874, xv, p. 44) general anæsthesia was found. It should, however, be said that in many instances, instead of anæsthesia, hyperæsthesia has been found, which suggested the lancinating pains of tabes (Hoffmann, Eisenlohr), and that often all sensory changes are absent, so that even these symptoms are far from being pathognomonic. The condition of the reflexes varies much, as does also the appearance of trophic and vaso-motor disturbances under the form of exanthematous eruptions, vesicles, ulcerations, erysipelatous swellings, etc., which are sometimes present, sometimes absent.

From what has been stated, it is obvious that we may meet with insurmountable difficulties in attempting to make a diagnosis in cases of syringomyelia, as has been shown, for example, by Charcot in one of his masterly lectures (Arch. de

Neurol., 1891, xxii, No. 65). Toxic paralyses, leprous neuritis, pachymeningitis cervicalis hypertrophica, trauma of the spinal cord, even amyotrophic lateral sclerosis and tabes, may present symptoms which suggest syringomyelia, and the resemblance may be so great that not infrequently the real seat of the disease may only be discovered at the autopsy.

Somewhat related to these dilatations of the central canal are those congenital cystic tumors which, penetrating through the walls of the vertebral column, make their appearance below the skin on the back. If the cyst, the size of which may vary from that of a walnut to that of a man's fist, is situated in the middle line over the sacrum, it is called a sacro-lumbar myelomeningocele, or spina bifida. The skin over the tumor is either normal, or the seat of a hypertrichosis; the latter is the case in spina bifida occulta (Joachimsthal, Berlin. klin. Wochenschr., 1891, 22; Jones, Brit. Med. Journ., 1891, p. 173; Bartels, Berliner. klin. Wochenschr., 1892, 33; Brunner, Virch. Arch., cxxix, p. 246; Joachimsthal, Virch. Arch., 1893, cxxxi, p. 488). Below the skin are found the bulging dura and arachnoid. The contents of the sac, which has sometimes smooth, sometimes rough walls, are as clear as water, and identical with the cerebro-spinal fluid. The spinal cord is attached to the inner wall of the sac by a broad base, or at its point of entrance divides into several strands which pass directly into the wall of the cyst. The coexistence of a hydromyelus with a spina bifida, the former causing an atrophy of the substance of the spinal cord and a communication between the central canal and the cavity of the spina bifida, is a rarity.

In a child born with spina bifida we find, as we stated, in the middle of the back, in the region of the sacrum, a soft, doughy, elastic, not rarely fluctuating tumor, which can be made smaller by pressure. The position of the child influences the condition of the sac. It is tense in the erect posture; when the child lies down it becomes flaccid and soft, a fact which must be referred to the communication usually existing between it and the cranial cavity.

Although the child thus affected may at first develop fairly normally, his life is endangered from the first moment. Not only does the pressure exerted upon the spinal cord by the increasing tumor lead to motor and sensory changes, as well as bladder symptoms, but there exists a constant menace to life which the rupture of the sac would entail, an accident which

is favored by the gradual thinning of the overstretched skin. Such a rupture is almost always followed immediately by convulsions and death.

The ætiology is not known. Possibly we have to do with a developmental anomaly, possibly, as Virchow believes, with an early formation of partial hygromata (hydromeningocele).

The treatment of spina bifida belongs to the domain of the surgeon. We may either endeavor to get rid of it by repeated puncture and subsequent injections of a solution of iodine in glycerine (Morton), or we may content ourselves with methodical compression. Owing to the danger of meningitis, however, the whole treatment should always be undertaken with great care.

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