being touched (hyperæsthesia of the skin), only then is the condition clearer, and finally can not be mistaken when such a focal symptom as paralysis of the eye muscles appears. Even then remissions may occur, and decided improvement or even complete recovery is not impossible. The outlook is always doubtful, and can, even when the prospects appear most favorable, be very serious.

(*b*) In adults the difference between the chronic and acute form is less marked than in children. Patients who have by no means presented definite signs of tuberculosis begin to complain of vague headache, general prostration and *malaise;* their sleep becomes disturbed and restless; especially in the morning they feel tired and unstrung; they complain of loss of appetite, and may have occasional vomiting spells. In some cases the psychical symptoms are the most prominent, and it may happen that the disease begins with the symptoms of a delirium tremens, especially if the patient be a drinker. In all cases the sensorium becomes sooner or later dull; the patient appears dazed, gives confused answers, and conveys in general the impression of a man whose mind is affected. Not rarely delirium comes on; in it the excitement and exaltation are the most prominent features. But with all these symptoms the influence of a severe, agonizing headache still makes itself known, and even during unconsciousness the patients often raise the hand toward the head, throw themselves about in bed restlessly with groans, and seem sensitive to the slightest touch or tap on the head. Epileptiform seizures have repeatedly been observed (Meloir, Étude sur la forme épileptique de la méningite tuberc., Thèse de Paris, 1888). The participation of certain cranial nerves, especially the oculo-motor and the abducens, is evident from the transient ptosis, the inequality of the pupils, and the strabismus; the ophthalmoscopic examination not uncommonly reveals choked disk. If in looking for the latter we are able to find tubercles in the choroid, this is of course of the highest importance for the diagnosis. The facial nerve, which often becomes affected, may be the seat of spasm or of paresis. If we remember that the base of the brain is the chief seat of the inflammation we can easily understand why these cranial nerves should be implicated. If motor disturbances, consisting of general or unilateral convulsions, or of hemiplegia or paresis, as well as speech disturbances, make their appearance, we may assume that an eruption of tubercles has occurred in the brain

cortex, an assumption which is to a certain extent supported by the occasional appearance of trismus. The more pronounced these disturbances, which are to be regarded as focal symptoms, the more likely is it that circumscribed tuberculous softenings exist in the cortex. Sometimes also a peculiar tonic rigidity develops in all four extremities which seems to be of reflex origin. The reflexes, at first increased, but presenting nothing characteristic, usually lose in intensity as the disease goes on, and finally disappear altogether. With regard to the sensory changes, it should be remarked that hyperæsthesia of the skin is not so regular a symptom in this as in the first described form of meningitis. The temperature, as a rule, is somewhat above the normal, yet it varies, and occasional remissions may be followed by elevations, or it may remain constantly between 101° and 102° F., or thereabouts. Nothing certain, however, can be said about it. Strümpell reports a temperature of 88° during the agony. Equally variable is the pulse, which as a rule is slowed. We may count 40 to 50 beats a minute, while in a few hours it may rise to 100 or 120.

Other organs take but a small share in the disease, and even the lungs show signs only when simultaneously affected with miliary tuberculosis. If the respiration assumes a Cheyne-Stokes type (after a series of shallow respirations, which become deeper and deeper, a complete pause), this is usually a bad omen.

To say anything positive about the course of tuberculous meningitis in the adult is impossible. It is not constant, but sometimes acute, sometimes chronic, sometimes presenting long intermissions, and sometimes steadily progressive. A subdivision into different stages may look very well on paper, but to demonstrate them at the bedside is only rarely possible. A period of cerebral irritation has been distinguished from one of increased intracranial pressure, and this again from a period of paralysis. The first has been thought to be characterized by headache, vomiting, and delirium; the second, by slowing of the pulse and paralyses; the third, finally, by increase in the frequency of the pulse, elevation of temperature, and deep coma. But such a division entails no practical benefit, as the so-called "stages" are often not distinguishable from each other, but pass directly one into the other. From the instructive treatise of Hirschberg (cf. lit.) we learn that even the manner of onset may vary much, and that it may be difficult even

in the stage of focal symptoms to make a diagnosis. If a consumptive suddenly develops symptoms of motor or sensory paralysis or irritation, this should always make us suspect the existence of a tuberculous process in the brain.

Diagnosis.—None of these different forms of meningitis that we have described is easy to diagnosticate, with the exception, perhaps, of the epidemic cerebro-spinal. When several cases have occurred in a community the recognition of new ones presents no difficulty, especially if we keep in mind the frequency with which herpes labialis is met with in the disease.

A serous meningitis may be not infrequently confounded with the purulent form, a fact to which Quincke has lately called attention in his excellent paper (Sammlung klin. Vortr., N. F., Leipzig, 1893, No. 67). The absence, or the slight degree, of fever, often also its irregular appearance, together with the relative mildness of the manifestations pointing to cortical involvement, such as headache, stiffness of the neck, and clouding of consciousness, and on the other hand the relative frequency of choked disk, are the features which are more characteristic of the serous form.

Of other diseases, typhoid fever is perhaps the most likely to be mistaken for meningitis. There is no doubt, and it has been shown by reliable observers (Curschmann), that there are cases in which meningitic symptoms are very well marked, but in which typhoid bacilli are found in the cord at the autopsy to be the infective agent. We might be led to believe that at least the characteristic temperature curve, the splenic enlargement, the condition of the stools, and the rose spots would be sufficient to make a mistake impossible, but this is by no means always the case; there are instances in which typhoid fever can not with certainty be excluded, and then the differential diagnosis is simply impossible.

If uræmia enters into the question of diagnosis, the examination of the urine (for tube-casts, etc.), suppression of the urine, if it should be present, and the appearance of the convulsions will facilitate the recognition of the true condition.

Whether we have to do with a case of croupous pneumonia or with meningitis is, in the majority of cases, easy enough to decide. Both affections may, however, occur together, and then it is important to remember that marked hyperæsthesia of the skin, staggering gait, and rigidity of the neck may all be present with pneumonia alone. If this be complicated by

œdema of the glottis, so that respiration is difficult, the patient will fix his head in order to bring into play the auxiliary muscles of respiration, and thus in the recumbent position too the rigidity of the neck is simulated (Wernicke). The existence of meningitis is only, then, to be assumed if pronounced basal symptoms are present, and especially if paralysis of the eye muscles has existed for a certain period of time.

More frequently delirium tremens is associated with meningitis, and we are not always able to decide whether the delirium, the tremor, and the epileptiform convulsions are referable to the latter or to the former.

It is well to remember that there are cases in which, although the symptoms of tuberculous meningitis seem pronounced, in a few weeks the patient completely recovers, in which instances the assumption that there is a pseudo-meningitis of hysterical origin seems necessary (Carrier, Lyon méd., October, 1892, lxxi). Of course, the previous history of the patient, the family history, etc., have to be taken into consideration before such a diagnosis, which we think is always very risky, can be even thought of. Of interest are the observations of Carin and Iscovesco (La France méd., 136, 1888) upon a diagnosis of meningitis in cases of iodoform poisoning.

The occurrence of meningitic symptoms as a consequence of worms, which Devaux (cf. lit.) has upheld, is certainly exceptional, and can hardly, for any length of time, give rise to an error in diagnosis.

With sufficient care we can easily avoid confounding meningitis with eclampsia infantum.

Prognosis.—The prognosis in every case of meningitis is very serious; we are never in a position to predict with any certainty the outcome, not even when everything seems to be going on very favorably, and grave symptoms have not declared themselves. These may suddenly develop in one night, and a patient whom we have left in fairly good condition in the evening may the following morning be hopelessly ill. On the other hand, we should not give up our patient too soon; the gravest symptoms may fade away, and improvement is still possible even where the case seems desperate. Undoubtedly, however, meningitis is one of the most serious diseases, and one in which recovery is rare, the epidemic cerebro-spinal meningitis being the only form which sometimes runs a more favorable course.

Partial recoveries are much more often seen than absolute ones. If, for example, in the course of meningitis, a hæmorrhagic inflammation of the inner ear develops, this gives rise to permanent deafness, which in younger children, as a rule, leads to deaf-mutism (Schulze, Taubstummheit und Meningitis, Virch. Arch., 1890, cxix, p. 1), or if purulent inflammation of the eyeball, a panophthalmitis or a choroiditis coexist with the meningitis, this may entail a grave disturbance of sight, even phthisis bulbi, and complete amaurosis. In either of these cases the meningitis may get well, but leave in one deafness, in the other impairment or loss of sight, and in the most unfavorable cases both remain behind without the development of any mental defects. Blindness may also be a consequence of an optic neuritis, which does not get well, but causes shrinking of the optic nerve and atrophy of the disk. Cases of meningitis confined to the convexity sometimes recover, leaving a more or less marked feeble-mindedness.

Treatment.—The treatment is first to be directed against the inflammation, and later endeavors should be made to aid absorption of exudates if such be present. For this purpose we make use of so-called surgical revulsives (Erlenmeyer, Deutsche med. Ztg., 1893, p. 61); for example, local bleeding and the application of cold inunctions of mercurial ointment, four to eight grammes (℥j to ℥ij) a day to the shaved head, or blisters (Mosler, Deutsche med. Wochenschrift, 1888, No. 30, p. 621). In some cases we shall succeed with such measures in lessening the severity of the symptoms, but often little or nothing is achieved by them. Painting the shaved head with tincture of iodine is objectionable, owing to the disagreeable and painful tension which it produces, and which is but little alleviated by ice. That free purgation with large doses of calomel actually produces an antiphlogistic effect can not be proved, but there is no reason why it should not be tried, the drug being given until the characteristic stools appear. The absorption of exudates is attempted by large doses of potassium iodide, four to six grammes (℥j to ℥jss.) a day in hot milk, a medication which is especially indicated in the gummatous form of meningitis.

During coma the patient may be put into a tepid bath (90° to 93° F.) and cold water (66° to 60° F.) be poured over his head. These cold-water affusions may be continued for eight or ten minutes, with the frequent result of actually rousing the patient out of his unconsciousness, an improvement, however, which generally does not last very long. The repetition of this procedure several times a day is therefore necessary, notwithstanding the considerable difficulties with which it is (at least in private practice) attended.

Symptomatically the agonizing headache and the jactitations may be met with morphine. The same drug is used against the obstinate vomiting, which is hard to treat, and indeed may resist all efforts. It may happen that all internal medicines, cracked ice, champagne, opium, aromatic tinctures, etc., as well as all applications of spiritus sinapis, etc., remain without effect; then we are forced to resort to morphine, the subcutaneous administration of which generally accomplishes more than all remedies previously used. The regulation of the bowels should of course never be overlooked.

We can only, then, with reason hope for success from our therapeutic efforts if we pay careful attention to the nutrition of the patient. As soon as this is left out of sight the battle is practically lost in spite of all medicines and inunctions. More than in any other disease it is here the chief task of the physician to see that the strength of his patient is kept up, so that he be fit, if necessary, to stand an illness of weeks; and more than in any other disease is here the prolonged use of wine indicated, and is much more important than all drugs. Besides wine, a tablespoonful of beef-tea is to be given every hour. This is prepared by gradually heating lean beef cut into small cubes, after the addition of a little salt, in a lightly closed glass bottle over the water-bath, and cooking it until the pieces are completely disintegrated. Two pounds of meat furnish about a cupful of beef-tea.

In very exceptional cases operative measures are indicated, namely, where we have sufficient reason to suspect the existence of an exudate in the ventricles, which would manifest itself by an aggravation of the symptoms of increased intracranial pressure. Trephining and tapping of the ventricles (Keen, Philadelphia) may then be resorted to if the circumstances are in other respects favorable. In cases of otitis media the tympanic membrane should be punctured and the cavity syringed out with antiseptic solutions. It is scarcely to be expected that the treatment of tubercular meningitis by paracentesis of the spinal canal, a procedure practiced in four cases

by W. Essex Wynter (Lancet, May 2, 1891), will meet with general acceptance.

The treatment of tuberculous meningitis in children has to be conducted according to the plans just laid down, with this difference, that the inunctions of the head with mercurial ointment are to be replaced by the administration of calomel, three to five centigrammes (grs. ss. to j) every two hours. Besides, the inunctions of the head with iodoform ointment, lately so warmly recommended, should be tried; but here, too, the preservation of the strength must be our chief aim. Milk, with the addition of a little Hungarian wine or a few drops of cognac, should always be kept ready.

LITERATURE.

Bull. Ueber die Kernig'sche Flexionscontractur der Kniegelenke bei Gehirnkrankheiten. Berl. klin. Wochenschr., 47, 1885.

Leyden. Bermerkungen über Cerebrospinalmeningitis und über das Erbrechen in fieberhaften Krankheiten. Zeitschr. f. klin. Med., xii, 4, 1887.

Devaux. Oxyures et symptômes pseudo-méningitiques. Progr. méd., No. 46, 1887.

J. Simon. Diagnostic différentiel de la méningite tuberculeuse. Gaz. des Hôp., No. 132. Nov., 1887.

Wolff, Felix. Bemerkungen über das Verhalten der Cerebrospinalmeningitis zu den Infectionskrankheiten. Deutsche med. Wochenschr., 50, p. 1080, 1887.

Weichselbaum. Ueber die Aetiologie der acuten Mening. cerebro-spin. Fortschr. d. Med., 18, 19, 1877. ("Diplococcus intercellularis meningitidis.")

Hofmann v. Ueber die acute Meningitis in angeblich ursächlichem Zusammenhange mit Misshandlungen oder leichten Verletzungen. Wiener med. Wochenschr., 6, 1888.

Pio Foa und Guido Bordoni-Uffreduzzi. Ueber die Aetiologie der Meningitis cerebrospinalis epidemica. Zeitschr. f. Hygiene, 1888, iv, No. 1, pp. 67 *et seq.*

Baaz. Die Cerebrospinalmeningitis, ihr Wesen und ihre Behandlung. Berlin-Neuwied, Heuser, 1888.

Freyhan. Zur Kenntniss der Typhusmeningitis. Deutsche med. Wochenschr., 1888, No. 31, p. 630.

Wolff, Felix. Ueber meningitische Erscheinungen beim Typhus abdominalis. Ziemssen's und Zenker's Archiv, 1888, xliii, Heft 2 u. 3, p. 250.

Stephan. Des Paralysies pneumoniques. Revue de méd., 1889, ix, No. 1. ("Meningitis as a Complication of Pneumonia.")

Adenot. Des méningites mikrobiennes. Paris, Baillière, 1890.

Fox. Amer. Journ. of the Med. Sciences, June 6, 1890, xcix.

Oebeke. Ueber Meningitis cerebrospinalis. Berliner klin. Wochenschr., 1891, No. 41.

Hilbert. Berliner klin. Wochenschr., 1891, No. 31.

Matthes. Linksseitige Hypoglossuslähmung bei tuberculöser Meningitis. Münchener med. Wochenschr., 1892, No. 49.

Trevelyan. Cerebro-spinal Meningitis. Brain, Spring Number, 1892.

Schwabach. Ueber Gehörstörungen bei Meningitis cerebrospinalis und ihre anatomische Begründung. Zeitschr. f. klin. Med., 1892, xviii, No. 3 u. 4, pp. 273–297.

Mertz. Deutsche med. Wochenschr., 1892, xix, No. 2.

Allya. Three Fatal Cases of Cerebro-spinal Meningitis, with Autopsies. Med. News, May 14, 1892.

Maulwurf. Wiener med. Wochenschr., 1892, xlii, No. 47.

Mensi e Carbone. Riforma med., 1893, ix, No. 2.

Zörkendörfer. Zur Bacteriologie der Meningitis suppurativa. Prager med. Wochenschr., 1893, No. 18.

Boix. Revue de méd., 1893, p. 413.

Randolph. Bull. of the Johns Hopkins Hospital, July 4, 1893 (forty cases of meningitis, examined clinically).

Klemperer. Ueber die Bedeutung des Herpes labialis bei der Cerebrospinalmeningitis. Berliner klin. Wochenschr., 1893, No. 29.

Friis. Ugeskr. f. Laegenidensk, 1893, xxvi, No. 27–29. ("On Meningitis cerebrospinalis epidemica.")