

cases, to the forehead. In younger children automatic movements occur, which also seem to be referable to the headache, and mostly consist in carrying one or the other little hand to and from the head with great rapidity. Generally, the pains do not intermit, but continue unceasingly till coma finally supervenes.

Older children remarkably often, still not regularly, complain of *abdominal pains*, especially in the epigastric region. These pains are materially aggravated on pressure, and may become so intense, whenever the stomach or any part of the abdomen is touched, that the patients utter loud, painful outcries. They do not, generally, persist as long as the headache, but they are apt to cease suddenly and to return. It is not always possible to attribute them to any pathological alterations of the intestinal mucous membrane. I have carefully examined the stomach and intestines in numerous autopsies of hydrocephalic children, in whom the abdominal pains were extremely well pronounced, but have never been able to discover any marked morbid changes.

The *shape* of the abdomen is extremely pathognomonic of the disease. At first nothing in particular can be observed; but, when vomiting, constipation, and the general hydrocephalic symptoms, have lasted for some time, the abdomen will daily become smaller, plaited, and depressed, and finally acquire the form of a boat. By very slight pressure, the abdominal aorta can be distinctly felt on the spinal column. This boat-shaped belly is generally explained by a paralysis of the abdominal muscles, which are said to simply overlie the contracted alimentary canal. This condition, however, is by no means produced by a paralysis, but by a permanent spasmodic contraction of the transversalis and oblique abdominal muscles, in which the muscular coat of the intestines also probably participates, for the intestinal tube is always found remarkably contracted. A certain degree of hardness and tension always remains in the abdominal parietes, even when this trough-like formation of the belly is extreme. On the other hand, a paralysis sometimes ensues in the last days of life, when the rigid depression of the abdomen disappears and the retracted abdominal walls become again soft and flabby. The case is different with the integument covering the abdominal walls. Paralysis affects it very early in the disease, as may be seen when a fold, having been raised by pinching with the thumb and forefinger, takes a long time to disappear.

The retraction of the abdomen is not absent in any case of hydrocephalus, and the description, *boat-shaped*, is very appropriate, for the symphysis pubis, the costal cartilages, and the ensiform cartilage, form high promontories, between which the contracted abdominal

muscles represent a deep trough. *Galis* regarded this symptom as of especial importance, and believed that by it acute hydrocephalus could be distinguished from typhus fever with the greatest certainty.

As regards the external alterations about the skull, they can only be observed in cases of unclosed fontanel. These will bulge out more and more with the augmentation of the effusion, and exhibit distinct fluctuation. In cases where the fontanel are already closed, a peripheral circulation of the veins of the scalp sometimes becomes rapidly developed, the result of pressure by the effused fluid upon the sinuses of the dura mater.

The *psychical functions* experience disturbances very early in the disease, in a manner that has already been described more minutely in the stadium prodromorum. The confused, blank look, the morose, peevish, irritable disposition, or, in other cases, the utter indifference toward beloved persons and objects, are the most striking peculiarities. Later, when the rest of the symptoms have already placed the diagnosis beyond all doubt, actual delirium also supervenes, but generally of a quieter kind than in purulent meningitis of the convex portions of the cerebral membranes. Furious delirium in the course of acute hydrocephalus occurs only exceptionally, and for very short periods, and is soon followed by quiet, muttering delirium, and this by a permanent state of profound coma. The intensity of the delirium, and the nervous symptoms in general, according to the investigations of *Rilliet* and *Barthez*, and which I have often been able to confirm by dissections, are by no means in exact relation to the extent of the disease found in the meninges. In cases of violent cerebral symptoms, where a thick layer of exudation and a large quantity of miliary tubercles were predicted, *traces* of them only were found here and there at the autopsy; and, in cases where no delirium at all, and only coma, was present in the last period of life, large quantities of effusion and extensive miliary tuberculosis have often been observed.

A very common symptom is a loud, mournful cry, recurring at longer intervals, and which *Coindet* considers so pathognomonic of this disease, that he unhesitatingly describes it as the "hydrocephalic cry." These children also often repeat for whole nights, at regular intervals, some monosyllables in a plaintive voice, or repeatedly exclaim, "O my!" which is always accompanied by a loud, deep sigh. These symptoms of irritation, extremely distressing and annoying to the sympathizing relatives to witness, fortunately do not last, at the utmost, longer than six or eight days, and are followed by profound stupor.

When these children have once fallen into a state of coma, they

never, as a rule, come out of it; sometimes, however, coma and delirium alternate, but the former always is predominant. *Rilliet* and *Barthez* report the cases as very rare in which perfect consciousness returned, only to be quickly succeeded by the previous coma.

The disturbances of the *locomotive apparatus* are extremely variable, and are not completely absent in any case of hydrocephalus, but they generally come on so late in the disease, that they can take but little share in the formation of the diagnosis. The stadium in which they appear is of great interest to the neuropathologist, and supplies some explanation of the innervation of different parts of the body. Convulsions and paralysis occur, the former preceding the latter, and it is necessary for us to distinguish between the general and local convulsions.

The *general* convulsions occur paroxysmally. At first the intervals between the paroxysms are long, three or four days frequently passing between the attacks. Generally, however, they recur oftener, and in some rare cases may last for many hours continuously. Usually, they begin at the inspiratory muscles, producing a suspension of the respiration, which is interrupted a few times in the minute by a rapid, incomplete act of breathing. They soon extend to the extremities, which are vehemently shaken by rapidly-recurring electro-tetanic jerks, which alternate with strong supinations of the forearms, and with opisthotonos. This very naturally induces marked venous stagnation; the face becomes red and even livid; the eyes injected, roll about in different directions, but mostly stare upward to such a degree that the pupil and but little of the iris are seen between the half-closed lids. After several minutes, sometimes after two or three hours, these general convulsions cease, when the patients, pale as death, sink into a state of the utmost prostration, and exhibit a marked aggravation of the general condition.

The *local* convulsions attack the most varying groups of muscles, most frequently those of the face. Here *distortions* of the *upper lip*, a *spasmodic smile*, and *peculiar sucking* acts, occur, by which the lips are kept in motion for hours. Strabismus is observed late in the disease; sometimes the child squints outward, and then again inward. The strabismus is often not permanent, but is subject to the partial irritation, or antagonistic paralysis of the various muscles of the eyeball, and in the last days of life it may disappear entirely.

This symptom, as has been said, comes on late; still, I can recall the case of a child which was brought to me simply on account of the daily increase of squinting. In the succeeding days other hydrocephalic symptoms steadily developed themselves, and at the autopsy a tubercle as big as a hazel-nut was found in one of the optic thalami.

Another peculiar symptom is the *gnashing of the teeth*, well known to and justly dreaded by experienced nurses. It also is due to a spastic contraction of the masticators, and is protracted till complete general paralysis takes place. Active partially automatic movements of the arms take place, and are described as twitchings, tremors, or startings of some of the tendons, while many hydrocephalic patients constantly keep their hands about the genitals and perform onanistic acts.

The lower extremities are less frequently attacked by convulsions than the upper; they are almost always in a semi-flexed and paralytic state; when spasms appear, they will be of the character of short tetanic jerks, during which the toes are widely separated.

The muscles of the *nape* and *back* are strongly contracted, and most of the subjects, when set upright or laid on the side, throw the head far backward. The tonic spasm of the abdominal muscles, by which the well-known boat-shaped belly is produced, has been already mentioned.

The *disturbances* of the sensibility, and the derangements that take place in the *organs of sense*, are no less remarkable. In most of the patients a decidedly heightened sensibility of the skin is observed at the invasion of the disease, which manifests itself by a greater susceptibility to external impressions. When raised from the bed ever so tenderly, or their posture changed however carefully, or the head, abdomen, or hands, touched ever so lightly, they will always resist and utter loud cries of pain. But this morbid picture changes rapidly as the effusion continues to increase, for paralysis of the nerves of sensation quickly ensues, and the child may be pricked, pinched, or handled, without any special care, may be treated with vesicants and irritating ointments, yet will make no opposition, merely manifesting by a low moan any pain it may suffer. The abolition of the sensibility is very strikingly shown in the conjunctiva, which may be stroked with the finger without causing the lids to move.

In addition to the strabismus, which has already been described in connection with the motor disturbances, and besides the blank, surprised look of the eyes, the *state of the pupils*, and the augmentation of the mucous secretion of the lids, are also worthy of notice. The pupillary contraction is very transient and by no means constant; generally the pupil has a tendency to dilate very early in the disease, and this dilatation perceptibly increases from day to day. Toward the end of the disease, the remarkable phenomenon of inequality of the pupils supervenes. Thus, in a child three years old, I noticed in its last days of life a unilateral dilatation upon the side on which it

happened to lie, and at the same time a peculiar oscillatory movement of the same eyeball, while the pupil and globe of the opposite eye remained undisturbed. By laying the child on its other side, I succeeded several times, though not always, in producing these alterations in the eyeball which previously had remained tranquil, while the other ceased to oscillate.

The observation of *Brachet*, that, under the influence of a strong light, the pupils which are already dilated will contract for a short time, and in one or two minutes dilate again, notwithstanding the continuance of a still more intense light, I have often been able to confirm. But, in the last days of life, even the most glaring light fails to make an impression upon the pupils. The secretion of the conjunctiva and Meibomian follicles increases during the disease, and it becomes necessary several times a day to remove the accumulated masses of mucus which collect at the inner angles of the eyes.

The *hearing* seems to continue longer, for the children, until they are completely comatose, will rouse somewhat upon being called by name, and even when spoken to in a low voice. The taste and smell become abolished only toward the fatal end; for the child very decidedly objects to being rubbed with ointments of bad odor, and refuses to take unpleasant-tasting remedies.

As regards paralysis, it may be remarked that general, lasting paralysis, such, for instance, as occurs after a *commotio cerebri*, is never observed. Hemiplegia, on the other hand, occurs in some cases, and lasts till death. At the autopsy, in addition to the miliary tuberculosis of the meninges, one or several large, old, yellow tubercles are generally found within the brain. Most frequently paralysis of one or the other upper eyelid, or one half of the face, with participation of the muscles of the tongue, is observed. Paralysis of one of the upper extremities, and more rarely of one of the lower extremities, also occurs. The retention of urine in the last days of life is, as has already been stated, not to be attributed so much to a paralysis of the bladder as to a paralysis of the secretory nerves, for usually the bladder does not become distended so as to be felt above the symphysis pubis, and the catheter discovers no large quantities of urine.

Death, as a rule, ensues after violent convulsions of many hours' duration, and only exceptionally do the paralytic symptoms steadily advance to a fatal termination.

In the majority of cases it is very easy to make out an approximate diagnosis, but whether it is of a tuberculous, or simply of a purulent inflammatory nature, it is usually impossible to decide. In both processes, the cerebral symptoms are alike, only in the simple meningitis they come on much more rapidly and are more violent, ter-

minate more quickly, and possibly may also end in recovery, while tuberculous meningitis must be put down as an inevitably fatal disease. More concerning this may be found in the section which treats of simple meningitis. With typhus fever it is scarcely possible to confound this disease, if any diagnostic skill at all be exercised. The diarrhoea, the tympanitis, the rapid pulse, and the splenic tumor, are such constant signs of typhus fever, while the retracted abdomen, the constipation, the manner of vomiting, the slow pulse, and the unrhythmic breathing, are such striking symptoms of hydrocephalus, that an error in the diagnosis can hardly happen. It is more probable that a chronic gastric catarrh, from which older children become emaciated, and with which some cerebral symptoms may also be associated, may mislead us, and cause the two diseases to be confounded. In the section on intestinal worms a case was related, where a child perished under hydrocephalic symptoms, and at the autopsy nothing but a large quantity of round-worms was discovered.

Although these cases must be regarded as extraordinary rarities, still we have seen that some verminous patients have wide pupils, that they vomit frequently, and even have slow pulse, and consequently we may easily be misled to entertain the supposition that we have an incipient though irregular hydrocephalus to treat.

What has been said hitherto has only reference to the completely-developed affection, not to the prodromata, which by no means admit of any diagnostic precision. This stage is, indeed, frequently confounded with commencing typhus fever, or with simple gastric catarrh, with helminthia and irregular and difficult dentition, and to these errors no doubt are also due the many reported cases of cured meningeal tuberculosis with hydrocephalic effusion. But the most essential points will always be found in the hereditary disposition, by the aid of which, in the doubtful cases, we are able to establish the diagnosis with tolerable certainty. If the father or mother, or one of the brothers or sisters, have already perished by tuberculosis, the probability that the doubtful symptoms belong to acute hydrocephalus becomes much greater than when no tuberculosis at all can be detected in the history of the family.

Termination and Prognosis.—I recollect to have had, at the very commencement of my professional career, a tolerably well-pronounced case of hydrocephalus, in which the child, after several weeks, was apparently perfectly cured. But the same boy, seven or eight years old, one year after his first sickness, again came under treatment, and then succumbed to a meningeal tuberculosis and extensive hydrocephalic effusion, which was demonstrated by the *post-mortem* examination.

In all the rest of my hydrocephalic patients, of which I have had at least thirty, death, when the symptoms once indicated cerebral dropsy, invariably ensued after two to three weeks. But, by thus defining the time, we do not intend to say that the disease will always run its course within such a period; for in no disease is it so difficult to determine the time of commencement as in the one under consideration. Formerly it was customary to date the commencement of the disease from the day on which the child took to the bed, but attentive mothers observe a whole list of symptoms for weeks and even months before this, which they are unable to explain, and for which they consult the physician.

As in my own experience not a single child has recovered from this disease, and only a single one has overcome one attack to perish from a relapse during the following year, I am forced to regard the prognosis as absolutely fatal. On the other hand, humanity, as well as policy, commands us to afford the relatives a ray of hope till the fatal end, for, by inspiring hope, the labor of nursing is vastly lightened, and you retain the patient, and thus keep it out of the hands of others who may manage it less humanely.

Cases are recorded which purport to be recoveries from acute hydrocephalus, and their truthfulness is vouched for by names of good repute. It is, however, hardly necessary for me to state that I have tried the treatment recommended in these cases with the utmost care and accuracy, and have, nevertheless, always experienced the same uniformly unfortunate result.

Treatment.—The only essential service which the physician is able to render in this terrible disease is to be sought for in establishing a strict prophylaxis in these tuberculous families. Every thing that is liable to produce cerebral congestion must be strictly prohibited. Such children must not be mentally overtaxed, nor allowed to exert their faculties for any length of time continuously. They should not play at wild, boisterous games, should not run long nor rapidly, nor jump, nor dance, etc. Their heads should always be cool, and be well protected against the direct rays of the sun. In general, all those precautionary measures to be hereafter recommended, in tuberculosis as a dyscrasia, are to be scrupulously observed. Especial attention is to be bestowed upon the state of the bowels, for constipation is well known to be a frequent and an active cause of cerebral congestion. The stools, however, should never be promoted by any drastic cathartics nor neutral salts, but those nutriments which experience has proved to be constipating should be avoided, and a free use made of those that are known to possess slightly-laxative properties. From the earliest time to the present, it has been a subject of dispute whether scrofulous

affections, particularly humid eruptions of the head and face, have any connection with hydrocephalus, for almost all the children of tuberculous parents suffer from these cutaneous eruptions. Formerly it was unanimously conceded that they ought not to be treated except so far as cleanliness demanded, for it was observed that, after a certain time, occasionally not till after many months, these eruptions ceased to discharge, formed dry crusts, and when these fell off the normal cutis was seen beneath free from any visible cicatrix. There is no doubt that our predecessors in therapeutics, who were indisputably more officious than the present generation, and knew as well as we do that the cure of an impetigo is very much promoted by solutions of nitrate of silver and corrosive sublimate, by lead-water, and zinc-ointment, came through unpleasant experience to the conclusion that it was safer to discard these decidedly efficacious remedies. Of late, such a precaution has generally been regarded as disadvantageous, and scrofulous eruptions of the head are removed as quickly as possible, a practice which I too favored for a long time. But it has happened to me twice that children, in whom extensive eruptions of the head dried up suddenly, were at the same time attacked by hydrocephalus. Consequently, since that time, I have entirely renounced this desiccating treatment. Of course, I do not intend to declare that there is an actual connection between eruptions on the head and acute hydrocephalus, for to establish such a connection those two cases are by no means sufficient, and may be contradicted by many hundred others, in which the eruption of the head dried up rapidly without being followed by any ill effects. But, since it has also been proven by an equal experience that they heal spontaneously without any thing at all being done for them, it follows that an expectant treatment will probably do no harm, and that possibly something beneficial might, in the end, be gained by it.

But what treatment are we to institute when the first symptoms of hydrocephalus have actually appeared? The answer may be readily divined by recalling what was said as to the prognosis. In few diseases is it possible to pronounce all remedies so positively ineffectual as in the one under consideration; and, if in the remainder of this section the various methods of treatment hitherto proved to be useless are but briefly described, it is not with the intention of challenging observation, but rather for the purpose of showing the therapist how much has already fruitlessly been tried in this fatal disease.

In the first days of the disease, derivatives upon the skin are in special favor; a seton in the nape of the neck, large pea issues in the arms, a blister kept in a constant state of suppuration, pustulating ointments of tart. emetic or sublimat., cauterizations with potassa

fusa, all serve the same purpose, to wit, to produce a severe cutaneous irritation, with as profuse subsequent suppuration as possible.

That the antiphlogistic method of treatment has been employed with various degrees of vigor, and in every stage, is well known. Leeches have been applied to the temples, behind the ears, on the nape, at the anus, between the thighs, and large or small venesections in the arm, foot, and jugular vein. Ligature of the carotids even has been proposed, but I am not aware of its ever having been performed.

The application of cold has also been tried in various ways. The ordinary cold-water compresses are constantly kept on the sheared or shaved scalp, a bladder filled with ice is laid upon the head, the head is washed or douched two or three times in the hour with cold water, and an apparatus even has been invented for the purpose of keeping up an uninterrupted irrigation. To the first measures there is nothing objectionable, but the irrigation plan is an altogether too elaborate for practice.

"For this purpose," according to *Bouchut*, "the neck of the child is wrapped around by a water-proof cloth, which communicates with a gutter on each side of the bed. A thin stream of water is allowed to flow down upon the head of the child from a reservoir suspended over it, and is carried off in the gutters above mentioned." Whether hydrocephalic children will quietly submit to be thus showered, is not stated, but to me it appears extremely improbable.

Among the remedies capable of bringing about an absorption of the deposited exudation, mercury and iodine rank first, and the diuretics next. Of mercurial preparations, blue ointment, corrosive sublimate, and calomel, are most frequently resorted to; the last two are given in large doses, so as at the same time to operate on the bowels. Even tartar emetic, as high as several grains daily, has been administered as a general alterative remedy. Phosphorus also has been tried, on account of forming one of the component parts of the brain. Of the diuretics, nitre, digitalis, squills, and juniper—of the antispasmodics, assafoetida, camphor, moschus, castoreum, have been used. In restless, delirious children, opium has been given with marked tranquillizing effect, but the majority of physicians dread the paralyzing action of this remedy, and too readily believe that the steadily-increasing deterioration of the patients is in part caused by the opium. But he, who has seen a number of such cases perish without narcotics, will administer opium, or, still better, morphine, without timidity and without suffering any compunction of conscience, in cases of great restlessness and severe headache.

The short but extremely sad *résumé* of the whole treatment then is, that at first the treatment, as for a simple, non-tuberculous meningitis, is mildly antiphlogistic, with small doses of calomel, blue ointment, and cold ablutions of the head, and perhaps also by the application of moderately-active cutaneous irritants, and nervous excitement is tranquillized by morphine. Torturing, violent applications are to be avoided entirely, for their inefficiency has often enough been made evident, and it is admitted that methods of treatment which torture are only permissible when there is any hope of benefit. And yet, in a disease that is universally regarded as fatal, all possible therapeutic experiments are practised.

(2.) MENINGITIS SIMPLEX, PURULENTA, AND ENCEPHALITIS—(Simple Inflammation of the Meninges and the Brain).—Although chronic hydrocephalus very naturally ranges itself with the acute, still a few words may be said here of simple meningitis, on account of the many analogies between it and the preceding disease.

It is a much rarer affection than acute hydrocephalus, and occurs no oftener in children than in adults. In this disease, portions of the brain proper in proximity with the meninges almost always are involved, and, as inflammation of the meninges cannot be clinically distinguished from congestion and inflammation of the cerebral substance proper, it is, therefore, best to describe these different morbid processes in one clinical discourse.

Etiology.—Occasionally the causes of this disease can be ascertained with great accuracy. The usual causes are traumatic—cerebral concussion, which, on account of the liveliness and awkwardness of the child, often enough occurs, injuries acting directly upon the cerebral substance, great heat and cold, insolation, immoderate mental exertions, and the propagation of inflammation from adjacent organs. The most frequent cause in this respect is otorrhoea; less frequently the meningitis takes its source from an ozæna, or from an inflammation within the orbital cavities. Meningitis also occurs after erysipelas, but, in the majority of instances belonging to this class, the erysipelas seems to be of a traumatic nature, and hence a purulent absorption through the osseous vessels must be assumed. Those cases of meningitis following metastases, repercussed cutaneous eruptions, suppressed epistaxis, etc., are mostly problematical, though even for these some very reliable vouchers are found in medical literature. At certain times this disease has been seen to appear in an epidemic form.

Pathological Anatomy.—The dura mater participates in the inflammation in traumatic cases only, and in these the morbid process always remains circumscribed, and produces a flat, fibrinous, or purulent layer of exudation upon that membrane. In chronic cases, which in