This matter is looked on too lightly. It is said that the bladder symptoms entirely disappear after the removal of the kidney, but Dr. Frank's observations are that the bladder symptoms remain, although they gradually wear away in time in a limited number of cases. The bladder having been accustomed to empty itself so frequently that this symptom does not disappear at once. Dr. Frank thinks that if an early diagnosis can be made before the bladder has acquired this habit of emptying itself frequently, the troublesome cystitis after nephrectomy would be very rare. With the aid of the cystoscope early diagnosis should be easy. In all large cities there are means of catheterizing the ureters and if a tuberculous kidney is found it should be removed at once.

DR. J. G. SHERRILL said that he always tries to determine the condition of the function of the other kidney before the operation. It is urged by many that the catheter should not be passed through an infected bladder into a sound ureter. There are many cases in which much can be learned by passing the catheter into the ureter, and if the bladder has normal mucous membrane it is perfectly safe to pass a catheter into the sound side. If the two urines are examined the presence of bacilli, as well as the ability of the kidney to take care of the function, can readily be determined. Recently Wright and Killmer have advised a new method of determining the efficiency of the kidney, a method of hemolysis. Dr. Sherrill said that he feels sure that injecting carbolic acid into the ureter would be a good proceeding if the ureter is but little if any affected, but if it is extensively diseased it would not be successful. The symptoms referable to the bladder are important, and many of the cases start with dysuria and polyuria. This is a very important point. The dysuria and polyuria are caused by the pus in the urine and should lead us to search for Koch's bacilli, and if found this proves the trouble to be tuberculosis. Bladder tuberculosis may be excluded by cystoscopy. If the urine is acid and contains pus it is important. Dr. Sherrill does not search one specimen many times, but many specimens a few times on succeeding days. Persistent search day after day for a week or more will usually result in finding the bacteria in the urine.

BRAIN INJURIES.*

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To determine whether or not immediate operative interference in brain injuries is indicated is a question of such serious magnitude as to require the most careful consideration of each individual case as it presents itself. Not infrequently, the life of the patient is in the balance, and his fate is determined by our decision one way or the other. The variety of symptoms presented in this class of cases is so great as to prove most perplexing to the minds of the ablest surgeons, many of whom have found at the autopsy that they have been in error in their diagnosis and decision. I feel fully warranted, therefore, in presenting a few facts as I have found them in the operating room and elsewhere, with the hope that the experience herein related may be the means of eliciting such discussion as will throw further light on the class of cases that has caused me great perplexity in trying to determine the advisability of an operation. It is my purpose to discuss this question from a surgical standpoint alone.

There can be no doubt that there is, and always will be, a distinct field for elective brain surgery. It would, indeed, be most unfortunate should there be a tendency to abandon so fertile a field for such brilliant achievements of surgical skill and such good to suffering humanity. Brain surgery has been so firmly established in recent years, however, that there is little danger now of its position being disturbed.

The symptoms which immediately follow injury to the brain are exceedingly important on account of their diagnostic value in determining the extent and nature of the lesion, and serve to aid in treatment and prognosis. It must not be forgotten, however, that the early symptoms may be misleading, and may not, by any means, reveal the exact nature of the injury. It sometimes happens that the most serious intracranial lesions may be found to exist in the presence of symptoms which would suggest only a slight concussion, while, on the other hand, a patient may quickly recover from an injury the early symptoms of which are so aggravated as to give the surgeon serious concern. The first symptom generally observed in serious head injuries is unconsciousness. It is not easy to determine the full significance of this from the symptom alone. In this connection, the most important question to determine is whether the unconsciousness is due to hemorrhage or to concussion or contusion of the brain. It is also of the utmost importance to know the manner in which the injury was received.

The symptom of unconsciousness alone will not reveal whether it is due to hemorrhage or concussion (unless the hemorrhage be from a cerebral artery, as in apoplexy) and as the hemorrhage due to injury is generally meningeal, it does not produce the degree of coma of a cerebral hemorrhage. The manner of approach of the unconsciousness is a most important diagnostic symptom; it is important to know if unconsciousness occurred immediately, after a few minutes or an hour or two, or if there was a return of consciousness after a primary loss, followed shortly by a reappearance of the former state. As a rule, when the patient has fallen from a height, striking on his head, serious lesion at the base of the brain may be expected; or a direct blow may be received on the convex surface of the skull, in such a manner as to produce a lesion in the cortical or subcortical substance, which will cause loss of consciousness. It is important to know the nature and location of the injury. It may be known that a man has received a blow on his head, but when first observed by the surgeon, the external evidences of the injury may have been so completely obliterated, or may not have existed at all, or may be of such a character as not to reveal the location of the blow, and unless there are present pressure symptoms, or other focal evidences, the surgeon may be deceived as to what has really taken place in the cranial cavity. While this state of false security lasts he patiently waits for a return of consciousness, while an increasing hemorrhage goes on within the cranial cavity. An increasing hemorrhage, of course, produces pressure unconsciousness. If the pressure is caused by a depressed fracture, examination will disclose the fact, and if there are marks of violence over the region of the middle meningeal artery, the fact should aid in the diagnosis. If it is determined that the early symptoms of the lesion are caused by a rupture of a meningeal artery, especially of the middle meningeal, the immediate effects may be regarded as most serious, unless relieved by prompt surgical procedure.

The success in a measure will depend on the surgeon's knowledge of cerebral localization. He must be able to determine with accuracy the location of a clot or lesion, or his surgical skill will fail in giving relief to the patient. He must know that on the cortex of the brain there are certain areas, not necessarily co-extensive with either lobes or convolutions, these centers are the visual, the speech, the auditory, the sen-

* Read before the Indiana State Medical Association at West Baden-French Lick, 1905.

sorimotor, and the centers of sensation, smell and taste. Cerebral localization has to do mainly with two fissures—the fissure of Rolando and the fissure of Sylvius. A knowledge of these areas aids greatly in determining the location of a blood clot, or other brain lesion, and with more exact methods of localization, with more precise craniocerebral topographical methods, and with constantly improving surgical technic, the percentage of successes has been increased. The readiness with which the surgeon recognizes the emergency, and the promptness with which he operates, has contributed no little to this success.

Fracture of the vault is usually the result of direct violence applied over a limited surface. When violence is attended by much momentum, the force is diffused, and a fissure will usually be found to travel from the point of primary inception to some distant region. A quick, sharp blow produces a local fracture, while violence with momentum produces a fissure. It is difficult to formulate a rule by which the direction traveled by these fractures can be determined. Direct violence to the vault from without results in a larger area of damage to the inner table than to the outer; and rarely, the amount of violence may be sufficient to break the inner table without fracture to the outer. The blow may not result in fracture of either table, yet the vibratory change in the shape of the vault results in a rupture of a vessel, with consequent hemorrhage, or it may result in actual contusion of the brain substance and displacement of cerebrospinal fluid and blood.

Again, we may have a transmission of the force to the opposite side of the vault from the point of the receipt of the injury, resulting in fracture by *contre-coup*. Whether this transmission of force is the result of the wave current, or whether it travels by other means to reach the opposite side of the skull, we are certain of the fact that in some way the force of the blow is transmitted to the opposite side, resulting either in fracture or other injuries.

The length of time that may elapse from the receipt of brain injury until active diagnostic symptoms appear, is indefinite, and may vary from a few minutes to several hours or many days.

Borel, as early as 1677, described a class of symptoms or disturbances the result of contusion of the head, which was neither dependent on a fracture of the bone nor a tear of the blood vessels, but was so transitory and of such slight intensity that an actual wounding of the brain could not be its underlying cause. Later when autopsies were more often made on patients dying from injuries of the head, a question arose which has only recently been answered. Following the most dangerous and severe brain symptoms the most careful autopsy failed to reveal the slightest trace of visible change in the brain of the deceased. In other patients, in whom all brain symptoms were absent, and in whom neither the motor nor the sensory functions had suffered, it was found extensive brain lesions existed, frequently a large portion of the frontal lobe was found crushed to a pulp. It is necessary, therefore, that physicians be extremely guarded in their diagnosis and prognosis in these injuries.

That surgical interference is imperative in these cases there can be no doubt. In a condition of hemorrhage of a typical character there are three consecutive stages that must be recognized, namely: First, a partial or complete unconsciousness, the result of stunning from a blow; second, the recovery from this, and later a

secondary unconsciousness coming on either slowly or with marked rapidity, as the result of pressure from a slowly accumulating hemorrhage; third, unconsciousness occurring as the result of an overwhelming hemorrhage, forming a veritable wet blanket over the brain. It is well to remember, however, that in the case of a rupture of a large branch, and especially the main branch of the middle cerebral, there will be such a rapid outpouring of blood as totally to obliterate the period of consciousness between the two stages.

Hemorrhage may be extradural or intradural, following a blow on the skull, with or without fracture, fissured or depressed. The frequency of hemorrhage in intracranial injury is quite marked. Phelps holds that in from 50 to 60 per cent. of the cases this factor occurs in sufficient quantity and such relation as materially to influence the final result, and to serve as a determinate factor of the symptoms; and that in about one-third of all cases it was either the direct or the sole cause of a fatal ending.

Operative interference is indicated when there are symptoms of compression, whether from hemorrhage, depressed bone, or the presence of a foreign body. The greatest mortality is in injuries caused by falls from a height, striking on the head, such as being thrown from a horse, or falling from a building or scaffold. Gun-shot wounds of the brain are almost equally fatal. In determining the question as to whether or not operative interference is indicated, it is necessary that the manner of receipt of the injury, the character of symptoms following, and the rapidity with which certain symptoms come on following the accident, be taken into consideration. If called on to assume the responsibility of a patient presenting such evidences of serious brain lesion as paralysis in some form, clonic convulsions of one side or the other, inequality of the pupils, with possibly unconsciousness or profound coma, and probably with Cheyne-Stokes or stertorous respiration, there is little doubt that the surgeon will readily recognize that surgical interference is imperatively demanded. I desire to emphasize the fact that, in my judgment, the danger to the patient of an exploratory opening with an observance of the highest degree of aseptic technic, is infinitely less than the unreasonable delay that is frequently permitted while waiting for definite diagnostic symptoms. It is in that class of borderline cases presenting only a few of the foregoing symptoms, and maybe in an exceedingly mild form, or in the cases in which it is necessary to depend for diagnosis largely or wholly on the manner of receipt of the injury, together with its character and location, that we are liable to be misled by an apparently unimportant array of symptoms, and to fall short of our duty as surgeons by failing to recognize at the earliest possible time the unusual symptoms pointing to a lesion at some point in the brain that could and should be relieved by operative interference. I would urge, therefore, the importance of the physician observing in detail each case of brain injury from the time of his first visit until such a time as he can reasonably assure himself that no injury has occurred within the cranial walls. It is not intended by any means to sacrifice conservatism, but rather to increase its usefulness by adding to it that degree of conservative boldness born of a knowledge of imperative duty, enhanced by a knowledge of anatomy of the brain, together with the significance of a class of symptoms, and the ability to apply the highest degree of surgical technic for the relief of this class of patients.

In this connection, the following report of two cases will be of interest in illustrating in a manner some of the statements contained herein:

CASE 1.—Three years ago I was called to attend a man aged 35, of remarkably strong physique, who, while in a fight, had been shot with a 38-caliber ball from a pistol. The bullet entered the skull from behind and well up toward the top in about the median line.

Examination.—It was found that the skull had been literally crushed for a space of an inch or an inch and a half in diameter. The dura was badly lacerated, and many fragments of bone were found approximately two inches down in the brain substance; there was also extensive laceration of the brain tissue.

Treatment.—These fragments of bone were removed, and the wound in the brain carefully but thoroughly irrigated with a normal saline solution, quite a quantity of the brain matter escaping. The dura was sutured as well as possible, the external wound closed and dressed and the patient put to bed.

Result.—The man made an uninterrupted recovery, and at the end of ten days was able to sit up, and in two weeks left the hospital apparently all right. The only symptom that showed itself following the operation was on the second day, when the man called attention to the fact that he felt something under his back and asked if it could be removed. On investigation it was found that he was lying on his left hand, of which he was totally unconscious so far as the hand was concerned, showing conclusively that the arm center in the brain had been slightly interfered with. This symptom lasted for only a few days, when it cleared up. The man was a coal-shoveler on the fleets, and the last heard of him, about a year ago, he was perfectly well and had suffered no inconvenience from his injury.

CASE 2.—A man, while engaged in repairing an electric light wire one day last winter, fell from a scaffold to the frozen ground, a distance of probably twenty-five feet, striking on the left side of his head. The only external evidence of an injury was a slight contusion of the scalp on the left side.

Examination.—When seen a few minutes after the injury he presented the following symptoms: Total loss of consciousness, inequality of pupils, the left being more dilated than the right, with slight conjugate deviation of the eyes toward the left; ecchymosis around the left eye, with considerable protrusion of the left eyeball; irregular pulse, and a slight tendency to Cheyne-Stokes respiration. There was a fracture of the left arm and left leg, which interfered materially with diagnosing any paralysis which might have followed the injury. Later it was observed that there was variation in the pupils, the left pupil contracting somewhat, with a slight dilatation of the right. Within twenty or thirty minutes following the accident he showed marked clonic contractions, or convulsions of both the arm and leg on the right side. The knee-jerk was slightly exaggerated on the right, while on the left the result was negative on account of the fracture of the thigh. It was difficult to test his sensory reflexes on account of his profound unconsciousness.

Treatment.—Injury of the left side, probably extensive hemorrhage from the left meningeal artery, was diagnosed, and it was decided to trephine. There appeared to be no injury to the vault of the skull whatever, both tables being intact. The opening was made a little anterior to the junction of the temporal, parietal and frontal bones on the left side. There was no extradural hemorrhage, although the dura appeared very tense. On opening the dura it was found that there was some extravasation of blood under the membrane which had followed the convulsions of the brain at this point. Simultaneously with the opening of the dura and the relief of the tension the patient's pulse and respiration became very much improved under the anesthetic. The wound was irrigated with a normal saline solution, the dura sutured, and the external wound closed. The improvement in the patient's condition continued, and was even more marked for twelve or fifteen hours following the operation, when he developed what appeared to be traumatic pneumonia, from which he quickly died.

Autopsy.—The autopsy showed some laceration of the brain

tissue, with rather extensive extravasation of blood at several points, and with a stellate fracture at the base, beginning at the junction of the anterior wing of the sphenoid and frontal bones, running backward through the middle fossa to the petrous portion of the temporal bone, and another line of fracture beginning at the same point and running forward through the floor of the orbit, and a third fracture line running through the cribriform plate of the ethmoid and crossing to the opposite side.

I have purposely refrained from taking up at length the various means or instruments suggested for gaining an entrance into the brain. It is believed that each of these various instruments has its advantages in certain cases and its disadvantages in others. This question has been so fully and ably discussed by such men as Keen and Mills and others that it seems unnecessary to consider it except in a general way. In brain tumors or in other diseased conditions, I am partial to the chisel and mallet. In brain injuries with laceration and probably wounded vessels with consequent hemorrhage, the trephine and the rongeur are to be preferred, lest by the use of the chisel and mallet a further injury to the already contused or lacerated brain is had, or an already dangerous hemorrhage from a wounded vessel is increased. These, however, are questions to be determined by the operator when he assumes the management of each individual case as it presents itself.

FURTHER REMARKS ON THE MODE OF INFECTION IN UNCINARIASIS.*

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At the session of this Association at Atlantic City last year I presented a report of an experiment on a human being to determine whether the larvæ of the uncinaria would penetrate the skin. At that time I reported that, after placing soil containing larvæ on the skin of an individual, an eruption had followed, and that, after a period of seven weeks, the eggs of the uncinaria were found in the feces.

In this paper I report a second experiment, similar to the first, in which the soil containing the larvæ was placed on the wrist of an individual who had shortly before been discharged from the hospital after an operation for hernia, and the eggs of the uncinaria were found in the feces during the sixth week afterward.

In the first case, it was not feasible to obtain photographs of the various stages of the eruption produced on the skin by the larvæ, but in this second case I was able to do this, and present them in the report which follows:

METHOD OF PROCEDURE.

Preliminary Arrangements.—After making arrangements with the patient regarding the experiment, a specimen of feces was obtained containing an abundance of the eggs of the uncinaria. Some soil was next obtained and baked for an hour so as to eliminate any other organism. After cooling this soil, the feces containing the eggs were then mixed with it until the odor of the feces had about disappeared, sufficient water being added to render the mass slightly damp. This mix-

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