along the base of the brain and covered the medulla oblongata and pons.

DR. A. E. STERNE, Indianapolis—I have recently had rather a considerable number of operations, for, as you know, they frequently come together. In the first two weeks of March I had five operations on the brain. Some time in February of this year I lost a case through what I thought to be neglect on the part of the attendants at one of our hospitals in Indianapolis, a case which I had every reason to believe would recover. Dr. Hoppe's mention of the word "shock" recalls the case to me, as I have lost no case since I have made it an invariable rule to count shock as a part of the operation. I expect shock to follow; I do not wait until it comes. If there has been any degree of loss of blood, as there usually is in these cases, I feel almost sure that I am going to have shock, and I feel sure that we will have a rise of temperature up to 105; that is the rule, although it has frequently been supposed to be a fatal symptom. Before the patient comes from under the effect of the narcotic I have invariably given a saline infusion, and sometimes in addition to that a large enema, adding hypodermics of strychnia, in one case as high as 1/40 grain every ten minutes, keeping this up for the first twenty-six hours, and giving smaller doses thereafter. In that case the patient recovered, although, of course, it seemed a huge amount of strychnia to use. In all the subsequent cases I have had no ill results, and the last seven cases have all recovered. Of course, so far as concerns the final results of those cases, the time is as yet too short to decide; two were for tumors, two for cysts, and three were for conditions of idiocy. In the last three cases the idiocy was combined with spastic symptoms of a motor nature, and almost the entire top of the skull was removed, making a trephine opening on one side and a trephine opening on the other, joining in a circular fashion. No evil results whatever have occurred. I warned the family that they could not expect results immediately, and possibly not for several years, and I believe that precaution should always be taken.

I find that surgeons, as a rule, who are not neurologists are afraid to go deeply into the brain. There is no reason why they should not go deeply. We operate on internal hydrocephalus; why can we not go deeply into the brain at any time, always, of course, with the certainty in mind that a few symptoms in the motor area will follow? Owing to the fact that you have cut into the motor area there is usually a slight paresis remaining. So far as choked disk is concerned, it seems to me that optic symptoms are much more apt to be present in tumor. Cysts and abscesses do not produce choked disk in my experience nearly so often as the tumors, even when the tumors are of much less extent. Probably this is due to the greater consistency of brain tumors in comparison to the other lesions, and, therefore, the intracranial pressure will be the higher.

DR. MAXIMILIAN HERZOG, Chicago—I have been interested for some time in the subject of brain tumors from the standpoint of the pathologist, and I want to make a plea for a more exact classification of brain tumors. I think that blood cysts, and other cysts not true neoplasms in their nature, should not be included when we speak of brain tumors. Even if we find certain common clinical features we are not entitled to treat conditions so fundamentally different under the same heading. The books generally contain the statement that sarcomata are the most common neoplasms of the central nervous system. I am, from my own observations, inclined to doubt this statement, and I believe that gliomata are the most common tumors of the central nervous system. Dr. Hoppe reports among his cases one operated on, and well three years after the operation, as a sarcoma. I somewhat doubt the correctness of the pathologic diagnosis; I rather believe that this tumor was a glioma. It is sometimes not at all easy to make a correct histologic diagnosis of tumors of the brain, hence formerly many were diagnosed as glio-sarcoma, a classification which has been abandoned entirely for obvious reasons.

DR. H. H. HOPPE, in closing—The autopsy in this case showed that the tumor was much closer to the internal capsule than it was to the cortex. If the tumor is close to the cortex

there is no reason why there should not be optic neuritis. As to Dr. Herzog's views with regard to sarcoma, I would say that the diagnosis was made in this case by a pathologist. On the other hand, I have quoted in my paper a statement by Bergmann about sarcoma. There was one point that was not raised, and that is the question of diagnosis and its bearing on the results. Karl von Heller has tabulated all the published brain-tumor operations, and they are given again in Bergmann's book on "Brain Surgery." There are 116 cases of successful removal of brain tumors, and in these cases each tumor was localized before the operation; in over 60 per cent. of these cases were the patients benefited, and in only 7 per cent. was the death due to the results of the operation. On the other hand, there are 259 cases of so-called explorative cases, and in these 50 per cent. died as the result of shock. The point is, that if you can not localize your tumor you should not operate. The great point in brain surgery to-day is the accuracy of localization of the tumor before operation.

THE SKULL AND ITS CONTENTS.*

W. H. EARLES, B.Sc., M.D.

Professor of Surgery and Clinical Surgery, Milwaukee Medical College; Surgeon to Trinity Hospital and Milwaukee County Hospital; Consulting Surgeon to Emergency Hospital and Milwaukee Free Dispensary.
MILWAUKEE, WIS.

If the expression sometimes ascribed to Sir Astley Cooper, that "No injury of the head is too slight to be despised nor too severe to be despaired of," be true, I will need no apology for inviting attention to the subject, except perhaps for the weakness of its presentation. Injuries to the head should possess, for every practitioner, more than ordinary interest, as they entail more than ordinary responsibilities, and when we consider the many and varied conditions met with in this field of surgery, from the slight and apparently trivial scalp wound to the fracture of the base of the skull with its probable accompanying laceration of brain tissue and membranes, and possibly rupture of large blood-vessels, the range of thought necessary to comprehend and combat these conditions becomes apparent.

In the contemplation of this class of injuries we may say, in a general way, that the practitioner must ever keep in mind not alone the skull, but its coverings and contents, as well as the intimate relations existing between them, for even a slight scalp wound, if neglected, may terminate fatally, and what appears to be only a trivial blow on the head may produce fatal cerebral hemorrhage. We must, therefore, be prepared for any reasonable probability or possibility and must by the exercise of forethought and intelligently applied treatment strive to secure satisfactory *immediate* results and prevent undesirable *remote* ones. The anatomic position of the head being one of special and almost constant exposure to violence predisposes to a large number of injuries. The delicate nature of the skull contents predisposes to the gravity of these injuries, while the intimate relations existing between the coverings and contents of the skull, although apparently separated by a closed, bony wall, teach us that injury to the former predisposes to disease of the latter and should teach us how prudent it will be on our part to guard against possible unfortunate results by prompt and intelligent action. The natural openings which lead to the interior of the skull, while in their normal condition and undisturbed by traumatism, serve the purposes of their existence without imperiling the integrity

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of neighboring structures, but when once seriously interfered with they become dangerous channels through which infection may and often does reach the structures lying within the skull wall. Thus it will be seen that nature's necessities predispose to gravity in any injury to the head.

Nature has, however, made many admirable provisions to counteract, as far as may be, the unfortunate though necessary conditions above described. The skull is not only covered by the pericranium and tough resisting scalp, but is also carefully lined for the better protection of its contents, the importance of which protection daily experience demonstrates. The shape of the skull, as well as the varying degrees of thickness which it presents at different points and in different individuals, must necessarily enter into all calculations as to the possible or probable injury to the parts lying immediately within its walls when subjected to violence. The elasticity and resiliency of the skull bones are factors sufficiently important in themselves to merit close study. The especially ingenious and practical arrangement of the anatomy of the skull, giving as it does the best possible protection to its contents consistent with limited weight and general utility, is another of nature's provisions for the protection of its own creation. In brief, the shape, physical characteristics, coverings and lining are so well adapted to resistance and protection that ordinary violence results in but slight injury, usually confining itself to the scalp and external soft parts and not extending to the bony wall or its contents.

The skull has, however, in common with other parts of the body, its limit of resistance, and when this has been overcome a multiplicity of pathologic conditions become possible. These conditions will demand, on the part of the surgeon, an intimate knowledge not alone of the normal appearances of the parts involved, but also of the possible or probable pathologic conditions resulting from any given injury, for on this knowledge—on the accuracy with which the surgeon can estimate the nature and degree of the effects of the traumatism—must depend in a large measure his success or failure in treatment. We know that, apparently contrary to general law, a slight blow on the head is sometimes followed by the most serious results, and vice versa, and we should also know as surgeons that there must be reasons for these strange results, and these reasons must be sought for, utilized, and made a part of the clinical history of each case. It is a well-known fact that a blow on the head may produce any one of a variety of fractures with or without injury to the brain, its coverings or circulation. The outer plate of bone may be broken without the inner being affected, and the latter may be fractured without the presence of any apparent or actual depression in the outer one. The writer met with a case, in 1895, where the post-mortem revealed a fracture of the inner plate of the skull $1\frac{1}{2}$ inches in length, great laceration of brain tissue with rupture of the middle meningeal artery, and yet there was not even a scalp wound nor any evidence on the outer surface of the bone to indicate in the slightest degree the character and extent of the injury within. As a rule, however, when fracture exists both plates are involved. When an injury is present it is usually found at or near the part at which the force has been received, although there are occasional exceptions. Whenever there exists an injury of sufficient severity to have lacerated the brain or its membranes, hemorrhage resulting in clot, or more rarely, inflamma-

tion resulting in exudate follows. In either case the cranial contents are increased in volume and, as the skull walls are unyielding, pressure on the brain is a natural and inevitable consequence. This pressure, limited at first, is likely to increase until the brain functions are seriously interfered with or until life itself is extinct. The altered and abnormal conditions within the cranium may result in but temporary and trivial altered nerve manifestations, or they may result in partial or complete abolition of the motor, intellectual or sensory brain functions.

It is reasonably safe to be guided by the rule that intracranial pressure, when mild and local in character, will result in but mild and local functional disturbances, but when the pressure becomes general through the extension of the clot or the exudate all functional disturbances become general or the pressure may be so pronounced as to entirely obliterate all evidences of the existence of the nervous system so far as function is concerned.

The injury to the brain substance through traumatism to the head may be very slight, resulting in nothing more serious than a number of pinhead clots which times readily absorbs, or it may be so severe as to require active surgical interference to control the dangerous hemorrhage which is often present. In the more severe forms of injury the patient's loss of consciousness seriously interferes with completeness of diagnosis, but usually sufficient information may be obtained from the history of the accident and an examination of the patient's physical condition to enable the surgeon to arrive at reasonably accurate conclusions.

Where fracture of the skull exists, especially if depression be present, the most important factor to be considered is the condition of the skull contents. The fracture itself is of secondary consideration. Any violence of sufficient force to cause fracture of the skull has in all probability caused some injury to the brain tissue or its coverings, and this injury very evidently assumes a more serious aspect if the fracture be a depressed one, for in this event a section of bone will be pressed down upon the brain coverings and even fragments of bone may be forced into the brain substance itself.

In the consideration of any line of treatment in severe cases our thoughts should center on the probability of injury to the soft parts within the skull, and our efforts must be directed along the lines best calculated to overcome the *immediate* and prevent, if possible, the usual *remote* effects of the injury. Horsley has clearly established that brain scars, scars in the dura and depressed fragments of bone, are frequent causes of epilepsy, and that the removal of these causes usually results in benefit to and often in cure of the patient. We are therefore admonished to exercise great care, at the time of injury, in our efforts to prevent this result.

In outlining a general plan of treatment we would say that no one can hope to do satisfactory work on the skull, its coverings, or contents, unless he is surgically clean. We must not forget that infection is readily carried from the scalp to the brain or its coverings and that such an occurrence can not be too profoundly regretted and, when resulting through the carelessness or the unsurgical habits of the medical attendant, can not be too emphatically condemned. The clinical reports of all careful workers in this particular field of surgery go to prove that we may enter the cavity of the skull and there deal with conditions demanding

surgical attention with the same confidence and assurance with which we enter the abdominal cavity, providing we exercise the same care and possess the same cleanliness. In all operations on the skull the entire head should be shaved and thoroughly disinfected before the skull wall is opened. All foreign matter should be thoroughly removed and, where dirt, hair, etc., have become lodged in the line of fracture, where fracture exists, the chisel and hammer must be used to remove them.

The next care of the surgeon is to ascertain, if possible, the nature and extent of the injury. Where fracture with depression is found, removal of a section of bone, either with the trephine or chisel, places the field of injury open to observation and clears up questions that must otherwise remain in doubt. In all cases sufficient bone should be removed to permit of a thorough inspection of the field of operation.

We now, with the injured parts easily within reach, proceed to treat them as we treat injured structures in other parts of the body. All foreign matter and blood-clots are to be removed, hemorrhage controlled either by hot applications, pressure or ligature, and all ragged edges of the wound excised, securing, if possible, smooth coaptating surfaces. The wound in the brain should be closed with catgut sutures, after which the dura mater is carefully drawn over it and closed with the same material and the outer wound closed and dressed in the usual way. When we feel that our work has been clean throughout, drainage is unnecessary, but if we fear subsequent septic trouble drainage should be provided for; the patient should be put at physical and mental rest and his condition carefully watched for at least ten days. Should septic trouble occur the parts must be opened up and a rigid antiseptic treatment instituted. He must ever bear in mind that the scar tissue resulting in wounds that do not heal by first intention is prone to be followed by those dreaded *remote* effects which are often immeasurably worse than death, and we should, therefore, leave nothing undone which may in any way conduce to or further the prospects of an aseptic result. In cases presented to us for treatment we must not carelessly overestimate or underestimate nature's possibilities, but rather by a careful consideration of all the conditions, facts and symptoms present, intelligently weigh the evidence and draw conclusions in accordance with its drift. Time spent by the surgeon in securing facts to strengthen his judgment is usually time gained for the patient and is therefore well spent.

This paper has not been written with the view of instructing, but rather of inviting attention to a field of surgery worthy, we believe, of more consideration than is being given to it and to stimulate a closer and more thorough study of the conditions with which it deals. Placed in positions where we may be called on at any time to assume the responsibilities involved in such cases we should, in doing even ordinary justice to our patients, be prepared to treat them with a fair degree of intelligence, and they should receive at our hands that degree of surgical skill to which in this day they are fairly entitled. The records of Macewen, Starr, Horsley, Fluchrer, Weismann, and others, combined with our present knowledge of surgical cleanliness, place us in positions to do at least reasonably accurate and successful work on the skull and brain, and when we consider the importance of maintaining the security and integrity of nature's great nerve center and its

peculiar liability to injury, time spent in specially fitting ourselves for work in this connection can not be regarded in any other light than that of wise expenditure.

402 Grand Avenue.

TREATMENT OF TYPHOID FEVER.

WITH BACTERICIDAL IN CONNECTION WITH OTHER AGENTS, AND SOME CONSEQUENT DEDUCTIONS.*

J. M. PECK, A.M., M.D.

ARLINGTON, KY.

It would be remarkable indeed for any physician, be he the most humble or the most distinguished—or his work restricted—if he is not called upon to cross swords with the disease designated as typhoid fever. The treatment of a typhoid fever patient, as we shall attempt to describe, is the outgrowth of our acceptance of the now old and universally admitted theory as enunciated by Eberth, and, except in rare instances, the primary and principal site of infection is in the intestinal tract, although there may be undoubted cases in which there is no perceptible inflammatory process in the alimentary canal.

Taking the fact for granted, then, in the great majority of cases that entrance of the bacilli into the system is by means of the ingesta, we would naturally expect the first local manifestation to be somewhere in this tract. This we find to be the actual condition in nearly all cases. In many cases, one of the earliest and most noticeable symptoms is a peculiar diarrhea, which we take to be a well-directed effort of nature to rid herself of the disturbing elements there. Bacteriologists and pathologists of to-day assert that the real disturbing element is not so much the bacilli themselves, but the toxins produced by them. The toxins are the cause of the toxemia, and when this toxicity is extreme, we have a condition of mental and physical inactivity so familiar to us all who have treated or witnessed many typhoid patients treated according to the old expectant way of management. If the Brand or any other treatment has no recommendation above the old, beyond the preservation of the mental faculties, for this alone they would demand our adoption in every possible instance. It seems the Brand method would favorably impress every thinking mind as meeting in a great measure almost every indication possible to be met in an uncomplicated case of typhoid fever except that to be met by means of intestinal antisepsis. But happy is the physician whose clientele is of sufficient wealth that he may carry the Brand treatment into their homes without frequently meeting insurmountable obstacles; or, on whom his grip is so strong that he will not run serious risk of losing desirable patronage and influence. In hospital practice the cold plunge bath stands easily first as a favorite treatment by the leading teachers of the day, but a large majority of the typhoid patients are treated outside of the hospital, and the question arises, what is the most expedient and successful way to treat them? Our very limited experience is to the effect that the nearest approach, in many respects, to the Brand treatment will be attended with the greatest success.

Elimination of the bacilli and also their toxins, in every way possible, not detrimental to the patient, is the very important object to be attained. This is effected

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