A large sella turcica, large as compared to the gland it contains, might be associated with manifestations of pituitary disturbance without a feature of disturbance appearing in the roentgen-ray picture.

DISCUSSION

DR. LEON T. LEWALD thought that Dr. Timme had given a most careful and conservative paper on the interpretation of the relationship between the pituitary manifestations and variations in the sella turcica. Since he had mentioned the heart, in regard to the compensation of the heart it might be apropos to refer to studies recently made in the army of the hearts of aviators under conditions of low pressure and low oxygen supply to determine if the heart dilated. Even in such a large organ, measuring from 12 to 13 cm. in diameter, it was difficult to differentiate a few millimeters in size as the aviator ascended 20,000 feet. Manifestly, then, still greater difficulty must be encountered in attempting to differentiate the slight changes in size of the pituitary fossa. In the aviator, account was taken of his size, weight and height. In the study of the sella turcica this was impracticable; for after considering a large number of healthy individuals, one would be struck with the extreme variations to be found in the pituitary fossa. Dr. Timme appreciated that fact and had stated definitely that under certain circumstances it was difficult to make the clinical manifestations jibe with no apparent change in the size of the sella turcica, and yet changes might be going on in the gland which did not cause any change in the bony formation. It was impossible to measure accurately the lateral diameter of the sella turcica, so the anteroposterior diameter and the vertical were the only two out of three dimensions usually considered. By stereoscopic roentgenographic examination a more accurate conception of the size of the fossa might be gained, and this should be made a part of the roentgen-ray examination. There were two things that were striking in Paget's disease: The conformation of the skull, which was almost the opposite of the conformation in cases of acromegaly; and the difference in the size of the frontal sinuses, which were greatly enlarged in acromegaly but in Paget's disease were very shallow. There was a prominence of the frontal bone which made one think there were large sinuses; but as a matter of fact they were exceedingly shallow. The syphilitic theory of bony changes in Paget's disease had been entirely exploded, though it was repeatedly diagnosed as syphilitic disease of the skull.

When a clinical history did not agree with the laboratory findings or roentgen-ray findings, it was well to trace the case up and identify the individual with the report of the special examinations.

PHILADELPHIA NEUROLOGICAL SOCIETY

Regular Meeting, April 25, 1919

JAMES HENDRIE LLOYD, M.D., *President*

A CASE OF INJURY TO THE BRACHIAL PLEXUS, PROBABLY THE INNER CORD. Presented by DR. CHARLES S. POTTS.

History.—Lieut. J. was wounded on July 19, 1918, by a machine gun bullet which entered on the right side about two inches below the clavicle and three inches to the left of the shoulder joint. He at once lost power in the arm and hand, and for a short time spat blood. Complete paralysis of the arm with intense pain continued for ten weeks, after which the pain disappeared and

motion began to return. His condition improved for one month and then became stationary and remained so until he was first seen by Dr. Potts, about March 10, 1919.

Examination.—At this time examination revealed: Inability to flex the index finger at either the first or second inter-phalangeal joint, weakness in flexing the hand on the wrist and weakness of all the intrinsic muscles of the hand. In other words, only the muscles supplied by the median and ulnar nerves were affected. There was atrophy of these muscles and they presented a fully developed reaction of degeneration. Complete loss of pressure, tactile, pain and temperature senses were present on both dorsal and palmar surfaces in the middle, ring and little fingers and in the hand to a line running from the middle finger to about the middle of the wrist. Above this on the ulnar side of the forearm to the elbow there was diminished sensibility. At the present time there has been some improvement in motion, but practically none in sensation. This condition is very unusual. The syndrome resembles that described by Stewart and Evans and is due to injury of the inner cord of the brachial plexus. The symptoms do not indicate division of the inner cord, but indicate that it may be involved in adhesions and scar tissue.

PERIPHERAL NERVE INJURIES. MAJOR G. E. PRICE, MAJOR H. O. FEISS, and LIEUT. W. B. TERHUNE contributed the paper which was read by DR. FRANCIS X. DERCUM.

Printed in ARCHIVES OF NEUROLOGY AND PSYCHIATRY, Vol. I, No. 5, May number.

DECEPTIVE HAND AND FOREARM MOVEMENTS IN PATIENTS WITH NERVE WOUNDS. Presented by MAJOR ANDREW H. WOODS.

Motor Symptoms.—Sensory changes seem more interesting to most examiners and there is a tendency to neglect motor symptoms and to overlook their significance. The important motor symptoms consist in diminution or loss of normal movements, addition of abnormal movements such as twitching and tremors, and substitution movements. In substitution movements the observer may be deceived by changes in position brought about by normal muscles or other forces which resemble the movements ordinarily due to muscles now paralyzed. Instances of these substitution movements cited were:

1. Elastic rebound of a joint due to the pull of soft tissues on the same side of a joint as the paralyzed muscles after they have been stretched by the active antagonists.

2. Movements produced by the tightening or relaxing of inert muscles through the action of normal muscles or other forces; for instance in patients with musculospiral paralysis the dead extensors of the digits hoist up the wrist into extension through the tension produced on them by flexing the digits.

3. The musculospiral extensors of the digits normally assist the interossei in extending the middle and distal phalanges, and they may replace the interossei in this movement when the ulnar nerve is paralyzed. Other "tricks" were mentioned by which lateral finger movements are imitated.

4. Pronation in cases of median nerve paralysis may be started by action of the musculospiral extensors and completed by gravity. Supination in cases of musculospiral paralysis may be effected by the biceps even with the elbow in complete extension. The trick of rolling the flexed hand into supination by allowing it to fall along the outer curve of the thigh was referred to as one that has caused mistakes in diagnosis.

ACUTE SOFTENING OF THE BRAIN AND CORD WITHOUT HEMORRHAGE IN NONPENETRATING GUNSHOT WOUNDS CAUSED BY IMPACT CONTUSION. Presented by DR. WILLIAMS B. CADWALADER.

Dr. Cadwalader said that his object in presenting the notes of the following cases seen in France was to call attention to the effect on the nervous system of the impact of a bullet or shell fragment without penetration. Softening of the brain and spinal cord can occur in nonpenetrating wounds without laceration or hemorrhage. The alterations of the central nervous tissue are caused solely by the local devitalization of tissue produced by the impact.

CASE 1.—This patient was first seen in an unconscious condition with left hemiplegia. There was a large depressed fracture in the right parietal region. The wound was nonpenetrating. Operation was performed and the depressed bone removed. It was discovered that the dura was not lacerated and no evidence of hemorrhage could be discovered. The patient died a few days later and at the postmortem examination it was found a large area of the right cerebral hemisphere was undergoing softening. No evidence of infection, hemorrhage or thrombosis could be detected with the naked eye.

CASE 2.—A soldier was wounded by a machine gun bullet, which lacerated the scalp and passed from the right to the left side, grazing the bones over the vertex of the skull. He became unconscious and suffered complete paraplegia. Repeated roentgen-ray examinations showed that there was no fracture. His paralysis improved slowly, and after six weeks he was walking with the assistance of a cane. Marked bilateral foot-drop persisted. The tendon reflexes were equal and only slightly exaggerated. A distinct Babinski sign was obtained but was not constant. The paralysis was flaccid and the gait was similar to that seen in peripheral neuritis. It is most probable that both paracentral lobules had suffered from the effects of the impact without hemorrhage. The absence of spasticity in the paralyzed muscle is singular. French writers have attempted to attribute this phenomenon to associated involvement of the cerebellum by contre coup, but this does not seem an adequate explanation. Dr. Cadwalader was inclined to believe that in cases of pure cortical paralysis there is always a tendency to flaccidity but it is not likely to be marked except in those cases in which only one segment of a limb is paralyzed.

CASE 3.—Severe intramedullary lesions of the spinal cord not uncommonly result from bullet wounds of the spinal column notwithstanding the fact that the spinal canal has not been penetrated and the dura mater has not been lacerated. An instance of this was found in a soldier who was hit in the back by a machine-gun bullet which was localized by the roentgen ray between the bodies of the third and fourth thoracic vertebrae. There was complete motor and sensory paralyses of all the parts below the fourth intercostal space. The patient finally died. At necropsy the dura was intact but the cord, at the level of the lesion, was swollen and soft. No microscopic examination was made, but to the naked eye, for the extent of at least one whole segment, there was necrotic softening without hemorrhage. Laceration and compression could be excluded.

The effects of contusion on peripheral nerves are very confusing. In examining patients a few days after receiving a wound of an extremity, it was frequently noticed that the extent of the paralysis was so much greater than would be expected judging, of course, by the location and character of the wound. Moreover, considerable return of function frequently took place in a few days.

The following case illustrates the condition.

CASE 4.—A soldier was hit by a machine-gun bullet in the lower jaw about half an inch to the left of the midline. The wound of exit was to the right of the midline posteriorly at the level of the third cervical vertebra. The spinal canal was probably not penetrated for the roentgen ray showed that the bodies of the vertebrae were not injured, but the course of the bullet must have been very close to the bodies of the third and fourth cervical vertebrae. The man stated that the instant he was hit he fell to the ground and that on arising, which he did without assistance, both arms were completely paralyzed. He said that he had not sufficient power in his arms to throw them over the shoulders of his companions who helped him to walk to the dressing station.

The next day there was complete flaccid paralysis of both upper limbs. The movement of shrugging the shoulders was not completely abolished but it was very weak and a little weaker on the left side. Cutaneous sensation was intact. The tendon reflexes could be obtained though greatly diminished on both sides. The lower extremities and other parts of the body were normal, but the tendon reflexes were exaggerated. The plantar reflexes were normal. After the first week motor power gradually began to return in the arms and at the end of two weeks the patient was able to extend and flex the forearm and fingers a little, but all movements were still very weak. The patient was finally transferred but was recovering rapidly.

It is not easy to determine exactly what the lesions were which had caused such profound paralysis, but it seems quite certain that the brachial plexus had escaped direct injury, because the course of the bullet was too high and it also appeared unlikely that the cord and its roots could have been destroyed. It is not improbable that contusion or concussion might have been responsible for at least part of such an extensive paralysis.

Mitchell, Moorehouse and Keen, in their book entitled, "Gunshot Wounds and Other Injuries of the Nerves," published in 1864, say on page 2: "A ball passing above the brachial plexus or just over any large nerve, will sometimes inflict injuries as severe and lasting with reference to the destruction of function, as the bullet which severs the nerve fibers themselves. For this reason we have been unable to classify nerve wounds so as to study the relation between the extent of nerve injury and the amount of the consequent shock."

NEUROPSYCHIATRIC PROBLEMS OF AN ARMY AT THE FRONT,
BOTH DURING AND IMMEDIATELY AFTER COMBAT was Dis-
cussed by MAJOR J. H. W. RHEIN.

Major Rhein said that the war neuroses as seen among the American forces presented some features which differed to a certain extent from those seen in the English and French armies. In the English army hysteria was more common in the soldier while anxiety states predominated among the officers. In the American army this was not true, anxiety states being common in the soldiers. The number of cases of major hysteria on the whole was less than in the French and English armies. Major hysteria was rarely seen at the front in army neurological hospitals where the cases seen could be classified for the most part as neurasthenics, psychasthenics, anxiety states, a few major hysterics and some which were examples of hyperemotivity representing what might be looked on as potential neuroses.

Soldiers who presented the symptoms of an excessive reaction to fear which for the moment incapacitated them and from which they recovered when removed from danger except for an anticipatory anxiety state, would develop fixed neuroses if they were not removed from exposure to front line experiences or if they were allowed to entertain prospects of returning to the front. The cases admitted to army neurological hospitals responded promptly to treatment of rest, good food, graduated exercises, suggestion and moral treatment. Between 60 and 70 per cent. of the cases were returned to their organizations within ten to fourteen days.

Fixed neuroses, consisting of major hysteria and anxiety states, were products of the contagion to which patients were exposed during their evacuation to the rear. In base hospitals were found hysterical manifestations in considerable numbers in contrast to the rarity of this condition at the front. The atmosphere at the front where these patients were treated within hearing of shell fire and where they understood that they were to return to their organization after some treatment, had a very different result from the standpoint of suggestion than that in the base hospitals which were far removed from the scene of warfare, where the safety of the situation emphasized in the minds of the men the dangers of the front, and where they picked up various symptoms from contact with other patients presenting fixed neuroses.

In over 50 per cent. of the cases coming into the army neurological hospitals the history contained a shelling experience. A diagnosis of hysteria was made in these cases. The trauma might be either emotional or physical. When the latter, the soldier stated that he had been blown over by a shell explosion. There was, however, no evidence on admission, of any actual cerebral concussion and rarely were the men unconscious when they reached the army neurological hospitals.

As to family predisposition in cases of war neuroses: A study of the histories of 332 cases showed that the family history was negative in 195 cases and positive in 137 cases for insanity, cancer, tuberculosis and nervous manifestations in parents, brothers and sisters. A history of previous nervous manifestations in the individual was found in about 50 per cent. of the cases.

Major Rhein said that there was no doubt that many healthy individuals developed in a short time due to the severity of their experiences, a state of nervous instability which would require months or years to develop in civil experience. Some cases showed psychotic reactions which presented transient symptoms suggestive of dementia praecox, manic-depressive psychoses and paranoid states.

A STUDY OF THE SPINAL FLUID IN CASES OF PRIMARY AND SECONDARY SYPHILIS. Presented by DR. JOSEPH McIVER.

This study was undertaken with the idea of determining so far as possible what percentage of cases of primary and secondary syphilis would show infection of the cerebrospinal fluid as might be demonstrated by the usual laboratory methods. The tests made on each specimen of spinal fluid were Wassermann test reaction, protein determination and cell count. Comparison of the blood Wassermann test has been made in every case with the findings in the spinal fluid. The duration of the disease, the present signs of syphilis and previous treatment have also been taken into consideration.

This study was made on a series of ninety-one cases, the majority of which were either in the primary or secondary stage of syphilis. The lesions manifested varied from early chancre to a fading secondary rash. A few of them,

however, were well past the secondary stage. Only one out of every four or five patients had taken any previous treatment and that was usually a very small amount.

All of these cases showed a 4+ Wassermann test reaction of the blood serum, as this was one of the determining factors as to whether or not a study would be made of the spinal fluid. The cell count was made immediately on removal of the spinal fluid. The average number of cells per cubic millimeter was 9. No effort was made to classify them. The greatest number of cells per cubic millimeter for any one specimen was 17. One of these was a case presenting a chancre of the lip with marked glandular involvement but no secondary rash; the others were cases of well-marked secondary syphilis. Taking a cell count of 5 per cubic millimeter as the average in normal spinal fluids, practically all of these cases showed a slight abnormality. Change in the spinal fluid of cases of secondary syphilis has been given from 10 to 90 per cent.

If we may consider a slight increase in cells an abnormality, then undoubtedly a large number of the primary and secondary cases of syphilis would show abnormal spinal fluid. This must be regarded as only of suggestive significance as there are a number of conditions that may produce an increase in cells. At the same time, we have to admit that cell counting is subject to error.

Only two of these cases showed a slight excess of protein in the cerebrospinal fluid, and curiously enough one of these was in the chancre stage, the other case was one of two years' duration with no previous treatment. The Wassermann test reaction of the spinal fluid was negative in every case with only two exceptions and they were of four and six years' duration respectively. Very little treatment had been given to either one.

In performing the Wassermann test reaction on the spinal fluid, 0.6 c.c. was used, 0.2 c.c. being the usual amount. The increased amount of fluid had no effect on the reaction.

Conclusions: 1. There is a slight increase of lymphocytes in the cerebrospinal fluid in the majority of cases of primary and secondary syphilis.

2. The increase in protein content does not appear as early as the increase in lymphocytes.

3. In this series, not a single 4+ Wassermann test reaction was obtained on the spinal fluid of primary and secondary cases of syphilis.

4. It does not seem reasonable to conclude that it can be determined by the examination of the cerebrospinal fluid from cases of florid syphilis just which cases will develop symptoms of the central nervous system.

DISCUSSION ON WAR NEUROSES

COL. SAMUEL LEOPOLD said it was impossible to discuss all the papers as his experiences were chiefly with the war neuroses. He saw very few head cases at the front. The same applied to cases of injury to the peripheral nerves. In his first station where his organization was brigaded with the French it was simply a case of evacuating the patient as soon as possible. In the next station there were better facilities for studying the war neuroses. Colonel Leopold had the opportunity of handling some 200 cases in this area; 50 per cent. recovered in less than a week and were sent to the front. Fright or terror with exhaustion constituted the clinical picture. There were some cases of hysteria. It was interesting to find in the hysterical cases that the symptoms could be removed quickly, though not so easily as in the fright cases. This led him to believe that the latter was possibly a potential or beginning neurosis.

MAJOR T. H. WEISENBURG said that there were three types of cases observed in the General Hospital in Plattsburg Barracks, the only war neuroses hospital conducted by the War Department in this country. The first type of cases were those who came from camps in this country; the second, patients who had been to France but who had not been in combat; the third, soldiers with actual fighting experience. There was some difference in the type of neuroses presented by these three groups. The first were chiefly hysterical, the second were made up of neurasthenics and anxiety groups, whereas the majority of the combat patients were so-called intractable hysterics, with the exception of the officers who presented anxiety types. There was not much difference in the hysterical manifestations between the overseas and the local troops, except that the former were perhaps more difficult to handle because of the many hospitals through which they had passed.

A very striking fact that impressed itself on an observer was the makeup of the war neurotic. Plattsburg is an old post in a town of about 10,000 people, and the patients and medical officers were intimately associated. Major Weisenburg was on duty in this hospital for a period of about four months. This is mentioned because when one lives among these patients their mental makeup is much more apparent than it is to anyone who sees them only occasionally. Many of the overseas patients wore decorations to which they were not entitled and which the War Department had not authorized. These men were boastful and more than willing to talk about their fighting experiences, which were usually imaginary. One rather expects this from soldiers but not to such a great extent. They were difficult to manage; that is, there were more complaints and more infractions of the rules of the hospital than is usual. Individually these men were not a likable lot. This was further impressed on Major Weisenburg, who, after this experience in Plattsburg, was ordered to Base Hospital No. 1 in New York City, where he organized and had charge of the organic neurological service and where most of the patients had peripheral nerve injuries. The contrast was more than striking, for in the organic group the boys were less boastful, less talkative, less complaining, easily managed and much more cheerful than the men of the neurotic type.

The curing of the neuroses in Plattsburg offered no special difficulty. Major Weisenburg had charge of all therapeutic measures and instituted a so-called "atmosphere of cure," similar to that adopted in other neurological centers abroad. All the medical officers, hospital corps men and nurses were given lectures on the nature and curability of hysteria. The patients were mentally boosted and with the teamwork thus instituted, practically all intractable cases were cleared up in about two months. Once the reputation of the hospital was established, the cure of even the most difficult hysteric did not take very long, the hospital corps men and nurses doing equally good work with the medical officers.

One very interesting observation was made in regard to the question of suggestion. Before the armistice, it was very easy to bring about various symptoms and many precautions were taken to guard against adverse suggestions. While the armistice made no appreciable difference, and there were no spontaneous cures, nevertheless it was almost impossible after the armistice to suggest new symptoms. As an example of this, Colonel deSchweinitz spent a week with these patients and did his utmost to suggest new phenomena in studying visual fields. His experience is interesting in the fact that it was impossible for him to accomplish this, although he found the usual tube fields and visual contractions of the ordinary hysteric.

Regarding peripheral nerve injuries: In organizing the service in Base Hospital No. 1, New York City, the usual faradic and galvanic batteries were discarded and the so-called condenser apparatus was used. This apparatus has a great advantage because it is possible to measure accurately the amount of current in microfarads necessary to produce stimulation of a nerve or muscle. A normal muscle or nerve will respond to about 0.03, whereas an interrupted nerve will not respond at all. A partially interrupted nerve will take about 0.1 microfarads. Also this current has the advantage in not being painful.

The greatest impression that the peripheral nerve cases made on Major Weisenburg was the ability of the remaining normal muscles to substitute for the loss of action of those which were paralyzed. For example, in musculospiral palsies, the patient by flexing his fingers, by means of the median and ulnar nerves, produced a pseudo-extension of the wrist, giving the appearance of extension in the musculospiral distribution. In cases in which the musculospiral nerve escaped, and in which the median and ulnar nerves were paralyzed, the opposite took place; that is, the patient first extended his wrist, causing an approximation of the fingers with the palmar surface, giving the impression of median or ulnar nerve action. The ability to do this depends largely on the person and on the length of time after the injury. A bright, active, ambitious boy, with thin fingers will be much more successful than a boy less perspicacious with thick fingers.

In this connection it is interesting to refer to a recent paper by J. R. Hunt, appearing in *Brain*, 1918, in which this author claimed that there are two systems of the motor fibers transmitted in the peripheral nerves. This author claimed that there are a certain number of nonmedullated fibers in peripheral nerves transmitting so-called paleokinetic fibers, subserving associated movements, which according to him, come back first in regenerating peripheral nerves. He based this theory largely on two cases of musculospiral palsy in which he had seen, what appears to Major Weisenburg to be nothing more than a pseudo-extension of the wrist, brought about by the action of the median ulnar groups. With Major Woods he had studied a great many cases of musculospiral palsy, in which all showed this phenomena. In a number of such cases, subsequent operation had shown the two ends of the musculospiral nerve to be completely divided and some distance apart. Dr. Hunt's theory therefore has no basis.

At first Major Weisenburg was somewhat loath to advise operations in peripheral nerve injuries unless there was definite evidence of total interruption. Experience, however, has shown him that wherever the progress is slow and not what it should be, an exploratory operation in the hands of a competent surgeon is advisable, for operation cannot do harm and in nearly all such instances, even when there is no actual interruption of a nerve, there has always been found sufficient surgical evidence to warrant operation.

LIEUT. GEORGE WILSON said that his neurological experiences in France were with Base Hospital No. 34 and with the Seventy-Eighth Division. During June, July and the early part of August, 1918, he saw a great number of cases of neuroses that had filtered all the way back to Base Hospital No. 34 which was located at Nantes, because the facilities for caring for these cases in the front area were not complete at that time. A great number of these patients responded readily to suggestion, isolation and other methods so that only a few had to be sent to Base Hospital No. 117. At Nantes Lieutenant Wilson saw a limited number of peripheral nerve cases, but as

Base Hospital No. 34 was the only functioning surgical hospital in that area, those cases were evacuated to other hospitals not entirely completed in order to make room for the great number of wounded who came in during those critical days.

About the middle of August, Lieutenant Wilson was assigned to the Seventy-Eighth Division as psychiatrist and remained with that organization until November 25. When the soldiers suffering from the various neuroses were seen in the triage and kept, so far as possible, in a nearby field hospital, 75 per cent. were returned to their organizations in ten days. When these men were seen before their tremor and other symptoms had become fixed it was a relatively simple matter to straighten them out and return them to duty, much easier than it had been in the base hospital. In the last three weeks of the war, which Lieutenant Wilson spent in the Argonne sector, the number of cases of the psychoneuroses that he saw were very few. This may have been due to the fact that the weak sisters had been weeded out or, what is more likely, that the outlook had changed from a long and cruel war to a short and merry one.

COL. WAYNE BABCOCK stated that he had been especially interested in cases of nerve injury. Over 350 had been admitted to General Hospital No. 6, Ft. McPherson, Ga., and something over 200 patients had been operated on. About 260 nerves had been explored under the knife. Something less than half of the nerves had been subjected to neurolysis and the rest to suture. The interesting feature had been that the proportion of sutured cases had increased with experience. This applied especially to certain neuromas in continuity with physiologic interruption, the paralysis from which had persisted in a number of cases without improvement three or four months after neurolysis and hersage. The sutured cases in general were giving more promise. It was too early to say more. There had been a number of interesting phases in the work; one was the study of partial nerve palsies in relation to intravenous localization. For example: In a case recently operated for foreign body near the internal condyle of the humerus the ulnar paralysis was limited to the flexor carpi ulnaris with complete sensory loss. As the sensory fasciculi and those supplying the flexor carpi ulnaris run in the anterior inner portion of the ulnar nerve at the elbow, it was interesting to see whether that corresponded to the lesion when the nerve was exposed. On exposure a little pocket was found in the anterior internal portion of the nerve, in which rested a small foreign body. In some of the other cases, there had been a somewhat similar correspondence between the tracts interrupted and the areas paralyzed. Most interesting had been the mapping of nerve patterns of exposed nerve trunks by the electric current.

Some of the results of operation had been rather anomalous until explained by careful study of the cases. For example: In one case of peroneal division, for which a suture was done, the extensive sensory loss apparently cleared up promptly. The boy said he had return of feeling on the third day after operation, and it was found that he had practically regained all sensory power, both to touch and to pain. The explanation was found in the fact that the musculocutaneous branch had not been divided by the injury and had been freed at operation, while only the anterior tibial fasciculi had been sutured. Of course in this case there was no early return in motion. Another interesting phase has been the size of the gaps that could be bridged, a technical problem of importance owing to the unreliability of nerve grafting. By adopting various expedients, in about 120 cases with gaps from 3 to

15 cm. in length, no case was found in which an end to end suture could not be made. The gaps were overcome (1) by the displacement of the nerve from its normal location—as the ulnar to the front of the elbow; the median from a deep to a superficial location; (2) by flexion or extension of adjacent joints; (3) position, adduction of arm, adding 5 to 8 cm. of slack to the cords of the brachial plexus; (4) by the normal slack and elasticity of nerve trunks.

To this has been added the interesting problem that has appealed to many, as to whether the nerve could be lengthened progressively under multiple operations. This Colonel Babcock had a chance to observe in one case in which a man had an injury extending from the chest along the arm. There was an extensive laceration of the median and ulnar nerves. In the first operation, a gap of about 5 cm. of the median nerve and 11 cm. of the ulnar nerve were overcome with suture. The nerves had so elongated three months later, that it was possible to excise an additional 10 cm. from the median nerve and 6 cm. from the ulnar nerve, and obtain end to end apposition with suture, although a total of 15 and 17 cm., respectively, had been removed from the nerves.

The rapidity of healing in nerves was also brought out by another case in which there was a gap of about 12 cm. in the sciatic nerve. During this operation, despite an acute flexion of the leg on the thigh, the tension was so great that when the man moved a little on the table after four or five stitches were introduced, the nerve pulled apart. Colonel Babcock went ahead again, and the nerve was finally well sutured by fine silk sutures. The patient was tied up, as they thought, very carefully, but that night, as Colonel Babcock went to the ward, he found the man had flexed the thigh on the abdomen and knew the nerve was pulled apart. Twenty hours after operation Colonel Babcock reoperated, but, on exposing the nerve, it was found to be absolutely together, and on taking hold of the ankle and extending the leg twenty degrees, he could see not the slightest tension on the sutures. The explanation was that the hamstrings had quickly adhered to the nerve, splinting it perfectly. As a result, instead of waiting many weeks to extend flexed joints, Colonel Babcock now started them quite early.

An added reason came from observing other men who deliberately extended their arms or legs, although they had been told not to do so, and who, despite this, had evidence of returning function corresponding well with the progress made by patients who had had short gaps overcome with suture.

MAJOR K. W. NEV stated that during the American offensive he was associated with evacuation hospitals or mobile units near the front in the capacity of senior member to a neurological operating team. This team did head surgery almost exclusively. In all cases as complete a neurological examination was made as circumstances would permit. All brain operations were done under local anesthesia, which proved to be the anesthetic of choice. When head wounds were complicated by other injuries the head operation was done under local anesthesia and a general anesthetic given for the debridement of other wounds. The operative technic employed was complete excision of the scalp wound; removal of the bone injury *en bloc*; evacuation of the disorganized brain substance by having the patient blow against his closed lips, or by coughing, the increase of intracranial pressure by this method proved very effective in the removal of the destroyed, oozing, semifluid brain substance. The dura was sutured whenever possible, but in all cases the cranial defect was covered by scalp, and drainage was never used.

If the patient survives the anatomic death which usually takes place in the first few hours, he then has to face the dangers which so often resulted in an infective death. It was in the prevention of this infective death to which we directed most of our efforts and where we found our reward by doing an early and complete operation. The mortality early in the service in gunshot injuries of the brain was between 50 and 60 per cent. in patients who had avoided an anatomic death, but who died from infections. By the above operative technic, advocated by Colonel Cushing, we were able to cut this figure down to less than 10 per cent. In a series of seventy-nine cases Major Ney's team lost but five from all causes. All brain cases were retained for a period of from eight to ten days after operation and it was often remarkable to watch the clearing up of preoperative neurological symptoms during this period. The most remarkable experience, however, has been the clearing up of many cases which looked hopeless at the time of operation, as well as when they were evacuated back to the base. The prevention of the infective sequela promised them life, but it seemed almost as though it would be better to let them die than to prolong an existence of absolute helplessness—but the function of the members of the team was to save life, and in doing this thought they had done all; but what nature and reeducation has done in many of these cases has been most remarkable. In a recent visit to Cape May, N. J., Major Ney found a patient whom he had classified in his personal records as dead. This man had had an extensive amount of brain destruction with a complete right hemiplegia and aphasia. At operation a foreign body was removed from the lateral ventricle and he was not expected to live. The man was evacuated and it was thought that he had died. You can imagine Major Ney's surprise when he found that soldier playing ball and talking perfectly.

WANTED AT ONCE

We desire for our files the following issues of the *ARCHIVES OF NEUROLOGY AND PSYCHIATRY*, for which we will pay 50 cents each: April and May, 1919.