quently the result of incompetent surgical services rendered the employe or passenger, who, by the railroad company had been placed in the hands of an unskilled, inexperienced, and consequently, incompetent physician, for treatment. This, in time, led to the appointment of "company surgeons," who, in the early history of railway surgery, were under the direct control and guidance of superintendents or managers. This was an important improvement over the former, but far from attaining the highest order of railway surgery.

Less than twenty years ago the first association of railway surgeons was organized, which had for its object the advancement and improvement of railway surgery. At that time such an office as Chief Surgeon was practically an "unknown quantity," and the now familiar "hospital system" was in its swaddling clothes, and it is less than ten years since the following resolution was offered by a prominent railway surgeon of Ohio, at a meeting of the Association of the Bee Line Surgeons, held at Cleveland:

In our opinion the surgical service of the Bee Line Railroad will be much improved by sending to well-established hospitals the injured employes, there to be treated by the regularly appointed surgeons of the road.

The question of the importance of railway surgery has been agitated by local, district and national associations, which have met from year to year and discussed the good and the bad methods of treatment of emergencies arising from railway accidents. The question of railroads without a surgical corps has been thoroughly considered, and the result weighed in the balance of economy. Heterogeneous systems of different methods where company surgeons were appointed by the superintendent or manager were tried by the different railway companies of the country, all of which have been carefully scrutinized and their results in dollars and cents to the stockholders carefully compared, whilst the hospital system, which has been adopted by a large number of the greatest railway systems of the world, has been held up before the piercing eyes of the active railway surgeon. as well as the advancing and observing manager or superintendent, and its merits thoroughly investigated.

During all these years, it has been the aim of the conscientious, active and experienced railway surgeon to ascertain from practical experience that method which will give the best service to the employe, the passenger and the company, for experience has taught him that these three factors were essential elements that cut a large financial figure, annually, and reduced the exchequer of every railway company. They realized that railway companies were not organized for philanthropic purposes, but on the contrary, were organized on purely business principles, and looked forward to a given amount of returns on a given investment with the least amount of expense and liabilities. From this standpoint, it is a logical sequence that a dollar saved is equal to a dollar earned, and while it has been found impossible to avoid the occurrence of accidents, the next best thing was to provide a method of caring for those who were injured by these accidents, not only in the most humane manner, but at the least expense and loss of time and permanent injury to the parties afflicted.

To accomplish this, I believe it is now beyond question and has been fully demonstrated by the leading and progressive railroads of this land, a majority, if not all of which, have hearkened to the advice of

their railway surgeons, that in order to attain the highest order of professional service, it was not only necessary to have an independent department, under the management of a competent chief surgeon, but in addition a well-organized and economically conducted hospital system that is prepared at all times to care for any class of injuries or illness that may occur in the operating of a railway system, with the least loss of time, the least permanent injury and the least expense, and the least suffering to the sick and wounded.

It seems a strange, but a happy coincidence, that at the close of the nineteenth century, not only the leading railway surgeons, but also the leading military surgeons, have, from experience, arrived at the same conclusion: that to make a department strong and efficient it must be independent.

ORIGINAL ARTICLES.

TRAUMATIC INJURY OF PERIPHERAL NERVES.

Read before the Fifth Annual Meeting of the American Academy of Railway Surgeons, held at Chicago, Oct. 5-7, 1898.

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Peripheral nerve injuries constitute a very interesting chapter in railroad surgery, on account of the uncertainty of the remote effects on the nerves themselves and on the organs and parts supplied by them. As implied in the above statement, peripheral nerve injuries may be considered under two heads: 1, the effects of injury on the nerve itself; 2, the effects on the tissues supplied by the nerve. In fact, however, the results, so far as the nerve itself is concerned, are so closely associated with the effects secondarily induced in other tissues supplied by it that they can not be considered wholly separate, and therefore can be more properly stated as the primary and secondary results of nerve injuries. The more recent advancements in neurophysiology and neuropathology have served to clear up—from a scientific standpoint at least—much that in the recent past was obscure, and have put us in possession of much valuable practical knowledge of what may be expected in the presence of a certain state of facts.

Every variety of peripheral nerve injury may be expected in the practice of railway surgery, but they do not materially differ from such injuries occurring in general surgical practice, except that the injuries themselves are more severely crushing in their nature. The pathologic changes which take place in an injured nerve are essentially the same in all cases, but the details will differ in certain respects. If a nerve is separated from its trophic center by division, the fiber below the point of section undergoes degeneration and is finally converted into a fibrous cord. Trophic changes in the muscles supplied by the nerve soon follow. These practical facts are well understood, and the surgeon promptly avails himself of them in endeavoring to reunite the divided ends and bring about as speedily as possibly a union and a restoration of function.

According to Strobe a down growth takes place from the axis cylinder of the central end, and the distal or peripheral end, which rapidly undergoes degeneration after division, is regenerated—at least to a certain degree—hence, if the nerve is united imme-

diately, it is restored sooner or later with a more or less complete restoration of function. If the nerve can not be united on account of extensive destruction, the down growth will take place to the extent of forming a bulbous growth at the central end of the nerve, as is so well illustrated in the division of nerves in amputations, and which so frequently cause great suffering to the patient. It is important, then, to remember in an amputation that when a nerve is divided, a bulbous extremity is formed in every case as a down growth from the axis cylinder, and that in the bulb new nerve fibers grow from the old nerves, and that these are joined by newly formed connective tissue fibers. The remote difficulties which arise from this conservative effort influence our course in relation to the management of the several nerves, particularly in their relation to the scar. Dr. Senn has suggested a flap formation in addition to the shortening of the nerve, as lessening the liability to bulbous development, particularly in patients who suffer from amputative neuromas when resection becomes necessary.

Omitting more than a passing notice of the facts in relation to divided nerves and amputative neuromas, we shall devote this paper chiefly to the consideration of injuries of nerves which do not involve their entire division.

1. Crushing injuries received by employes or others, in machinery or while engaged in various employments, involving the nerve in its continuity. In this division may be found two classes of cases: *a*, cases in which the nerve is seriously injured and is involved in the scar arising from the healing of the soft parts, or in the callus from the union of a fractured bone; *b*, crushing of soft parts in which the nerve escapes being caught in the scar but is seriously contused.

2. Strains and contusions received by employes and others, in wrecks or otherwise, which do not involve any structural change or serious lesion in the nerve and only for a short time interfere with its functions.

3. Injuries in which the peripheral end of the nerve is caught in the scar, incident to the healing of the soft parts.

Clinically, it is not always possible at first to determine just what the condition of the nerve is. The laceration of soft parts may involve also a laceration of the nerve, and in healing, the lacerated nerve may be involved in the healing of other soft parts, and a subsequent search for the nerve may show that it is difficult to distinguish the nerve from other tissues in the scar formation, and it may be necessary to seek for the nerve at a point above the seat of injury and trace it down with considerable difficulty. In other cases the soft parts may be extensively lacerated, and the nerve escape more than a severe contusion, which, for a considerable period of time suspends its conducting activity.

In the two classes of injuries referred to the symptoms will, for a time, be essentially the same, viz., paralysis. In these cases, however, if the arm is the part injured, and the laceration of tissues is so serious that the part is kept in a state of rest, the full disability may not be discovered until the healing process is well advanced, and then it is found that voluntary movement in certain muscles is impossible. Something can be done in determining the probable condition of the nerve by ascertaining if the scar is adherent to the bone or deep enough to include the nerve, also if the reaction of degeneration is present

in the muscles supplied by the nerve. If the nerve is torn across, or is so extensively lacerated and involved in the scar as to practically separate the proximal from the distal end, in the course of six weeks trophic changes will take place to such an extent that when the distal portion of the nerve is stimulated by the interrupted current the muscles will not respond. If, however, the nerve is only contused, trophic changes are less marked, and a more or less ready response to electric stimulation is found to exist.

Two patients, illustrating each of the above conditions, have come under my care. The first was a case of extensive laceration of the soft parts above the elbow. After the healing of the arm had progressed sufficiently to permit of motion, it was found that paralysis of the musculospiral nerve existed, as shown by the inability of the patient to supinate the forearm and to extend the hand. The reaction of degeneration, to a moderate degree, existed. As soon as healing was complete, an operation was made to discover the condition of the nerve. The nerve could not be recognized in the scar and it was sought for at a point above the injury. On tracing the nerve down it was found so intimately associated with scar tissue that only with the greatest difficulty could it be followed. A part of the nerve to the extent of about two inches was represented only by a connective tissue cord. This portion was resected, the nerve stretched from above and below and sutured. The arm was dressed in a flexed position, to relieve tension as far as possible. But, as was expected, the reproduction of scar tissue was so extensive that the former condition of the nerve and its surroundings were reproduced and the same disability continued. I doubt if nerve implantation would have succeeded in this case, for it has been my experience that any operation for the liberation of nerves in extensive scars has been attended by failure, or at least with very unsatisfactory results, on account of the reformation of the same dense fibrous tissue, with a recurrence of the former condition. It is quite different from the union and regeneration of a divided nerve in tissue where we have only the scar tissue incident to the healing of an incised wound, or where the scar is not so extensive as to forbid the anchoring of the nerve in normal tissue just outside the scar, so as to protect it from the multitudinous formations of new connected tissue.

In a second instance a man suffered an extensive laceration of the soft parts of the arm involving several points between the elbow and shoulder. As soon as the arm healed sufficiently to permit of voluntary movement—or at the end of the fifth week—wrist drop and an inability to supinate the forearm were found to exist. An examination showed an extensive scar over the musculospiral nerve, but the scar was not adherent to the bone, nor did it appear to be deep enough to involve the nerve. An electric examination showed that the muscles supplied by this nerve reacted well, and that there was but little atrophy of the muscles. I, therefore, became convinced that the nerve had suffered a contusion and was not lacerated or involved in the scar. I gave a rather favorable prognosis and continued the use of the interrupted current, with the result of a complete restoration of the functions of the arm in about three months.

In the second class are found injuries to nerves from strains and contusions in which there is no open

wound. These cases are quite common, and are often seen in litigation. They are often seen in association with general morbid nervous states as the primary condition. The pain is frequently exaggerated and may lead to a suspicion of malingering. A careful examination will generally reveal the facts. If the pain and tenderness follow definitely the anatomic distribution of a nerve, it may safely be assumed that the symptoms are genuine, for it is not often that the patient is sufficiently familiar with anatomy to successfully simulate pain that is confined to the nerve itself or referred, as it often is, to the nerve ends.

I have had cases under my care where a genuine nerve pain from an injury has continued for a few weeks and has led to morbid nervous states after the neuritis—which is no doubt the pathology—had subsided, and I am inclined to think these patients do not always receive proper consideration and treatment. Absolute rest is the essential treatment, and if promptly and persistently carried out, will save patients and corporations a great deal of trouble. But, unfortunately, neither the patient nor his doctor always fully appreciate the condition, and the best time for the treatment of these cases is allowed to pass unimproved.

The third class of cases includes compression of the peripheral nerves in scar tissue without the nerve itself being primarily involved in the wound, or not involved to such an extent as to destroy its transmitting functions, and no symptoms appear until some time after the wound has completely healed, when the evidences of an irritation lesion appear from the contraction of the scar tissue. If a nerve in its course is caught in the scar, the first symptoms are burning sensation, pain and numbness, followed by muscular spasms occurring at intervals, and at a somewhat later period, by anesthesia and motor paralysis below the lesion, due to interference with transmission of sensation and motion. The severity of these symptoms will depend upon the rapidity of the developing compression. If the compression is slow, the nerve accommodates itself to the condition, and the more severe symptoms are much delayed in appearing. If the scar compression occurs near the peripheral end of a nerve, the interference with transmission is less noticeable and the painful impressions are the first symptoms that attract the notice of the patient.

A case of this kind has recently come under my care. A bridge carpenter suffered an injury to his right hand, due to his hand being caught between two planks. The skin was broken on the palmar surface at the junction of the thumb with the hand and some muscular tissue forced out. The wound healed promptly. About five weeks later, after he had returned to work, he began to experience severe pain in the thumb, which extended up the forearm; this was soon followed by a twitching movement of the thumb and hand. This increased in severity, and he was obliged to discontinue work. After a little delay I cut down on the nerves supplying the palmar surface of the thumb and released them from the very abundant scar tissue. The wound quickly healed. But in about five weeks the old symptoms returned and increased in severity. Thinking that my operation had not been thorough enough I repeated the operation of liberating the nerves and removed all the scar tissue. The relief was complete for about six weeks, when the old symptoms of pain and muscular

twitching returned. As nothing could be expected from medical treatment, a third operation was made, which consisted in again removing the scar tissue and with it an inch of the two principal nerves supplying the thumb. This operation was followed by sensory paralysis of the palmar surface of the thumb and a complete relief of the painful symptoms. We now entertained the hope of a cure, save the anesthesia. In this, however, we were disappointed, for in about six weeks the pain again returned, followed by extremely painful contractions of the adductor and flexor muscles, which would violently flex the thumb closely down into the palm of the hand. These spasms would frequently occur every day and sometimes twice a day, lasting from fifteen minutes to an hour, and were attended by intense pain which would extend to the middle of the forearm. Associated with these spasms was a vasomotor paralysis, shown by the dilated blood-vessels and redness of the skin. This condition would disappear on the relaxation of the muscles and the return of the thumb to its natural position.

As the pain and spasms increased in severity, a fourth operation was made, and, at the suggestion of Dr. W. J. Mayo, all the tissues, including the muscle tendons, nerves and blood-vessels, were divided down to the metacarpal bone, circumscribing the thumb except on the dorsal surface at a point three-quarters of an inch from the original injury scar. Very profuse hemorrhage followed, but in the large wound inflicted the arteries were easily secured by catgut ligatures. The wound was united simply by skin sutures and a gauze drain introduced. The painful symptoms again disappeared and remained absent for so long a time that I concluded at last relief had been obtained, and just as I was in the act of writing Dr. Mayo, congratulating him on the success of his suggestion, the man appeared in my office to tell me that all the old symptoms had reappeared in an aggravated degree; that the pain was more severe than ever and the spasms more intense; in fact, the thumb was almost constantly drawn tightly into the palm of the hand. For short periods the spasms would relax and the thumb be restored to its proper relations. As a result of this fourth operation, the retraction of the soft parts and the maintaining of the thumb in an extended position, allowed some period of time to elapse before the parts were united by the formation of new tissue elements. As soon, however, as this had been accomplished and condensation had been reached, the pain and spasms returned. Before the painful symptoms reappeared after the last operation, the power to flex the thumb had returned, and this fact led us to hope for permanent results. After the pain returned the hyperemic condition of the skin from vasomotor paralysis still bore a constant relation to the periods of muscular spasms.

The condition demanded further efforts, and the thumb was now amputated below the head of the metacarpal bone. Skin flaps were only made. The entire length of the metacarpal was cleared of soft parts to its carpal junction, care being taken not to injure its median nerve, leaving nothing but periosteum and skin to cover it. The wound had scarcely healed when the most violent symptoms appeared; pain of the most violent character developed in that part of the hand supplied by the median nerve. The fingers supplied by this nerve were drawn into the palm of the hand for hours at a time. Sometimes

vasomotor spasms existed and sometimes vasomotor paralysis. The pain would extend to the shoulder, and the hand was in constant motion. At times the heart's action would be seriously disturbed; it would become irregular and intermittent. Gastric crises would occur, and, without nausea, the contents of the organ would be expelled. The periods of cardiac disturbance would be of short duration, but the gastric trouble would last for a week, no food being kept in the stomach, seriously interfering with nutrition and confining the man to his bed for a week at a time. During this time one-half grain morphin hypodermically was necessary, and to support the heart's action aromatic spirits of ammonia were freely used. In about three weeks, intervals of relief would come, at first for one day only; gradually these periods became longer, extending over two days, then several days. The heart improved, food could be retained, and strength was regained. At the end of three months recovery seemed to be well advanced. He exercised the hand a little in light work, but was quickly admonished by the return of some of the old symptoms, and now slight use of the hand, any exhausting influence or exposure to cold will cost him an hour of acute suffering. All the rhythmic motion of the wrist has disappeared, but there is an almost constant pain of slight degree present. The hand is slowly improving, but it is altogether extremely discouraging and causes considerable despondency at times.

The pathology of the case seems clear. A slowly developing neuritis followed the irritation lesion in the compressed nerve, and although the nerves were repeatedly freed from the scar formations, yet before the final and permanent release had been accomplished the degenerative process had extended up the nerve to a point which our operations did not reach. The fifth operation was made fifteen months after the injury. One thing which I especially noticed at each operation was the remarkably large amount of scar tissue which formed, and its extreme density. This appeared to indicate a peculiar trophic influence exercised by the nerves. This is supported by the fact of the frequent vasomotor disturbances witnessed. The additional fact of rhythmic movement in the wrist indicated that the ascending degeneration had reached the spinal cord and affected the motor cells in the anterior horns of grey matter to a certain degree. To what extent the degenerative change has involved the cord is an interesting question. The moderate atrophic change in the muscles of the arm affords a hope that the involvement is not extensive, and we find some comfort in the fact that the movements above referred to have ceased.

The fact that, following the early operations the symptoms disappeared, shows that extreme changes had not occurred, and, while the nerve was probably not free from some degenerative change, yet I think it is safe to assume that had the more radical operative procedures which were undertaken later been adopted at first, a much better result would have been obtained.

We have been slow in recommending any additional operative procedure on the ground that further disturbance would seriously compromise the nutrition of the nerve, which is already in a very precarious state. Our present hope is that by rest and general restorative measures the moderate improvement already realized may continue, although I have to confess that at the age of our patient—59 years—with

a distinct tendency to nerve degeneration, the prospect is not altogether brilliant.

DISCUSSION.

Dr. FRED J. HODGES of Ashland, Wis.—The Academy is to be congratulated in having a paper of this character presented before it. It is a departure from the stereotyped form of papers upon surgery of the peripheral nerves, and brings up a highly interesting case. In speaking of the injuries to which the nerves are susceptible, I would like to include in the Doctor's classification the incarceration of the nerve within the lines of fracture, not simply in the callus. But there are a certain number of cases of fracture in which there is developed, almost immediately, an intensely painful condition, and careful manipulation will discover that the nerve is incarcerated within the line of fracture. Failure to interpret this condition has led to amputation. The description of Dr. Fairchild's case, which he has given us fully and clearly, recalls to my mind one or two cases of the same nature. The point of similarity was that it was a lacerated and extensive wound, caused by the application of a very considerable degree of force. One case was a multiple fracture of the forearm, which was caused by a blow from a log. After the healing of the fracture, there was considerable pain, particularly over the musculospiral area. The arm was examined by a number of physicians, and finally was amputated by Dr. Reinhart of Ashland, on the advice of Professor Herdman of Ann Arbor, against his own judgment in the matter, however, so far as relief of the condition was concerned. Later the man came to Dr. Senn, who dissected down upon the stumps of the nerves in the axilla and removed them. A few weeks ago, we cut down again into the axilla and traced the nerves to their origin in the plexus, and divided them close to the plexus. There is now the same intolerable pain that there was at the time the bone first healed, and it is still referred to the palm of the hand and the wrist. A possible explanation of these cases may be this: The injury tears the more resisting nerve, not at the point at which the bone or the muscles give way, but from its insertion or origin in the plexus, and perhaps all the axis cylinders are destroyed. Some of the cylinders may recover, others produce a neuromatous condition.

In another case, which required amputation at the lower part of the arm, in endeavoring to pull down the nerves to cut them short in the stump, eight or nine inches of the proximal ends of the nerves were easily pulled out of the sheaths, showing that the injury which so smoothly divided the soft parts had also divided the nerve well up in the vicinity of the plexus. In the description of the case I was forcibly reminded of one which Hughlings Jackson mentioned in his Lumeleian lectures of 1890. There he describes what he calls convulsive seizures, and locates them in three levels in the cortex—the first and second in the subcortical areas and a third in the cord. His explanation of the case would be, according to this plan, a convulsive seizure of the third or lower level, and whether or not it could be explained on the ground of a peripheral reflex theory, or whether it was, as the Doctor has suggested, simply a degeneration extending up the nerve until it reached those centers, it is impossible to say without examining the cord. These cases are becoming more and more frequent, and in spite of the very best service that can be rendered them, they continue as a monument to what we do not know about neurology.

Dr. W. J. MAYO of Rochester, Minn.—I feel very much interested in Dr. Fairchild's paper. It brings to our minds, as Dr. Hodges has said, the fact that the surgery of the nervous system, taken as a whole, is the most unsatisfactory of all the different departments of operative surgery. I have seen a few cases such as the Doctor described in the first part of the paper, namely, the convulsive type, and very little benefit resulted from treatment. My brother, Dr. C. H. Mayo, has resected and reunited portions of the musculospiral nerve in three cases. These cases were the result of fracture of the humerus; power came on slowly, sensation returned promptly and remained. In the cases of direct incision, which I recall, in which the nerves were sutured at once, the results have been fairly good. In one case wherein the median and ulnar nerves were completely cut across, the results were excellent after primary suture.

I have seen two cases of typic paralysis agitans following injuries of the upper extremity—one a blow just below the shoulder, and the other a wound in the hand. The case the Doctor describes at some length is an interesting one. It probably would not come under the head of paralysis agitans, although the convulsive movements may have been the same as those described by Hughlings Jackson. I recall another case in which the great sciatic was divided. In this instance there was some return of sensation three months after secondary suture, but not much motion.

I recall a number of cases in which amputation neuromata developed, and in which operation was made not only once, but several times. I know of but one instance where resection of the stump was followed by other than temporary relief, and if the patients are watched a sufficient length of time, this will usually be found true. One case we operated upon four times; the last time up to the cord, and the result was only temporarily beneficial. In most of these cases we must consider that there is an ascending neuritis, and if we bear in mind that every nerve-fiber has its origin in the central nervous system, and that each axis has a direct continuation from its origin to its point of supply, the particular fiber by the ascending neuritis may be affected clear to its origin. In this way we can explain the reason for such a large percentage of failures following operations on the nerves. In the cases where we have signs of degeneration of the nerve-fibers, the successes are small indeed.

Dr. W. W. GRANT of Denver.—This paper is certainly worthy of serious consideration, for several reasons. A simple uncomplicated case in surgery requires little at our hands; but cases of the kind reported are exceptionally complex; they are difficult to cure, and hence are always worthy of serious consideration, not only in showing what we do not know, but in stimulating us to try and improve in our methods of treatment. There is no class of cases more interesting than those of peripheral nerve injuries in their after effects. One of the significant things in the cases reported by Dr. Fairchild, is the absolute failure of the surgical methods employed to cure them. And one other matter which seems to me worthy of consideration is that the disease has been regarded entirely as local in its pathology and has been treated locally. Are there not in some of these inveterate cases constitutional conditions preceding the injury—conditions which materially influence their character and their subsequent progress. Some of them are syphilitic; some of them may be tuberculous. These constitutional vices interfere very materially with the success of operative measures, and while I do not say this phase of the subject was not fully considered by the author of the paper, yet it has not been alluded to sufficiently to make a complete history of the cases. The cases reported by Dr. Fairchild are so instructive in themselves that, even as they are, the Doctor deserves very great credit for the able manner in which he has presented them. I would simply suggest that constitutional measures be added to the local in the treatment of these cases, and if this had been done in the cases reported, different results might have been obtained.

Dr. R. HARVEY REED of Rock Springs, Wyo.—I was very much interested in Dr. Fairchild's paper. It is an excellent contribution to this subject. Indeed, it is excellent in more ways than one. It is excellent because it shows the persistency with which the Doctor has followed out a certain injury with the object of giving relief; and it is interesting from the fact that he did not obtain relief after giving the patient the very best operative treatment that is known at the present day. Whether or not he could have pursued a better course remains a mystery, but I do believe, as has been said by Dr. Grant, that many cases come to us with constitutional contamination, and we can not obtain the same results from the same operations in those cases, or in the same class of injuries, that we do in others. This may have been true in the case of Dr. Fairchild. Of late years I have made it a habit, in cases where I have occasion to sever a nerve, of cutting the proximal end V-shape, so that the neurolemma would cover the nerve-fibers and give it plenty of flap, as it were, and I find that I do not have such trouble with neuromas as I had when I cut the nerve off at a right angle. I think, however, that in some of these cases we may obtain beneficial results by implantation. I have made a number of implantations of nerves after the Galbraith method, in which I have certainly obtained very satisfactory results. Where I am located at present we have a great many injuries to the nerves, and I have had occasion to make a great many implantations and nerve suturings. I find that there is a certain class of cases which behave just as the Doctor described, and which we believe to be tainted with syphilis, or due to some other constitutional condition with which we are not familiar at the time. Why it is, I have not well satisfied myself as yet, except where I can ascertain from treatment that they respond to syphilitic preparations. In this class of cases we derive no benefit from implantation.

I do not wish to take up further time, but I simply desire to thank the Doctor for presenting his interesting paper, which is of value to all of us, and I think worthy of our trip here. I am quite sure that I have been amply repaid for coming here and listening to it.

Dr. FAIRCHILD (closing the discussion).—I am very grateful

to the Fellows of the Academy for the courteous manner in which they have received my contribution. There was no attempt on my part to deliver an exhaustive dissertation upon the subject, but merely to give you a suggestive paper. There were two points particularly that I was anxious to dwell upon, and one was the question of implantation or any operative procedure for the purpose of restoring the nerve when there was a large amount of scar tissue present. In many of these cases of railroad accidents to the arm or to other parts of the body, there is an extensive laceration of soft tissues, and when healing takes place the wound is filled in with a large amount of scar tissue. My experience has been that any operative treatment on nerves in these cases is followed by absolute failure. I do not remember any successful cases following operative interference. Where you have a nerve divided without the probability of extensive scar tissue forming, then you may get some results from union of the nerve.

Dr. GRANT.—Have you operated in any of those cases after infliction of the injury?

Dr. FAIRCHILD.—I have waited usually until the wound has healed, because I want to operate through clean tissues. But the reason, it seems to me, was not so much the condition of the nerve below the point of injury as it was the extensive development of scar tissue which followed the operation at the point where the union of the nerve was accomplished. If we cut down on a nerve and remove a considerable amount of scar tissue, join the nerve, and leave the nerve short, in a short time the scar tissue is reproduced, and the nerve is the same as before. If you make the operation where the soft parts have not been lacerated, and where the probability of getting a dense scar is not great, then you can get good results from suturing the nerve, or if the nerve can be drawn from outside the scar tissue to avoid proliferation.

The method of which Dr. Reed speaks, with reference to joining the nerves according to the Galbraith method, could not, I think, be adopted in a case of this kind. The case of injury to the musculospiral nerve, which recovered, was one where there was no serious injury inflicted to the nerve. The nerve had suffered contusion, and the electric stimulation showed the absence of the reaction of degeneration. The nerve below had not undergone extensive degenerative changes, and this patient got well. The case of the man that has been interesting to me and has given me a great deal of trouble, is a patient that does not suffer from any symptoms or indications of syphilitic infection. Indeed, there is no history of any syphilitic infection whatever. He is a man of simple habits; has lived in a small country village, and is entirely free, so far as the history shows, from syphilitic disease, and yet it may be possible. He has been under the treatment of iodid of potassium, but not in large doses. The case appeared to be one primarily of irritation of the ends of the nerve due to the contraction of the scar, or of catching of the nerves in the scar, and the degeneration traveled up the nerve to a point in the central nervous apparatus, as I have shown by the symptoms. I regret now that I did not make a more extensive operation at the beginning. If I had done so, I have no doubt I could have removed that part of the nerve which was involved in the scar entirely, and might have avoided much of the trouble the man has had. Yet, of course, this is uncertain.

There is one class of nerve injuries which I consider extremely important to railroad companies, because of their medicolegal relations, and that is injuries to nerve-fibers that do not give rise to any positive symptoms. A short time since I had occasion to examine a case of that kind, and there are many opportunities of being deceived and imposed upon by persons who are not entitled to consideration. The Doctor is in great danger of being imposed upon by individuals who are not entitled to any consideration whatever. When a patient indicates the seat of pain, following definitely the distribution of nerves, I believe that the pain and symptoms he complains of are genuine. I do not think the average uninformed individual can point out the line which the nerve takes, or can map out the anatomic distribution of nerves. I had a case some time ago in which the individual outlined very definitely the course of the iliohypogastric nerve, and it was alleged that the man was a malingerer because no objective symptoms could be found. This man had not been under any instruction whatever, yet he followed definitely the course of this nerve. A man whom I examined yesterday indicated exactly the distribution of the sixth and seventh intercostal nerves of the right side. Just as soon as he got from one side to the other he claimed that he suffered no pain or tenderness. When a patient comes to me complaining of definite symptoms and follows the anatomic distribution of nerves, he has my confidence.