Remarks

ON

SOME POINTS IN THE TREATMENT
OF NERVE INJURIES.

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THE importance of the early diagnosis and correct treatment of injury of one of the nerve trunks of a limb is difficult to over-estimate. Injury, for example, of the median, ulnar, or musculo-spiral nerves, unless completely recovered from, leaves the patient permanently unfitted to follow any employment involving the full, skilled use of that limb.

I have pointed out¹ that after primary suture of any one of these nerves recovery may be perfect, the part being restored to a condition indistinguishable from normal; that² the same may occur after incomplete division; but, on the other hand, after secondary suture the prospect of complete recovery is not so good, and sensory recovery is rarely perfect. Considerable responsibility attaches to those who are called upon to treat cases of nerve injury, for the ultimate prognosis depends upon the prompt treatment at the time of the accident and the efficient supervision for many months after it.

It is still no uncommon thing to see patients in whom the nerve injury has been overlooked, or in whom recovery is incomplete owing to imperfect treatment at the time of the accident, or later. It cannot be too often reiterated that a careful search must be made for evidence of nerve injury in every case of penetrating wound, especially in the region of the wrist, and also in all fractures. The search should be systematic and carried out on a definite plan. In extensive wounds in the wrist region, the fact of the nerve injury should always be discovered before the wound is explored and the damaged structures dealt with. This rule is not infrequently broken, and has led to the union of divided nerves to the severed ends of tendons. In fractures of the humerus, if the nerve injury is produced at the time of the accident—that is, is primary—operation should be undertaken without delay; the division will usually be found to be anatomical and complete. If expectant treatment is adopted in the hope that spontaneous recovery will ensue, it may be impossible at operation at a later date to bring the ends into apposition after they have been freed, rendering nerve transplantation necessary. Much valuable time is lost, and the prognosis is not nearly so good.

If these points are remembered, the operation of secondary suture would be almost unknown. Nerve injuries are overlooked, not from any want of knowledge, but from the neglect of systematic examination. It is not necessary—and, indeed, may be impossible—in the cases mentioned to discover before exploration if the injury is complete or incomplete; the fact that a nerve is injured in a penetrating wound, or in connexion with fracture of the humerus, should indicate immediate operation.

There are three small but important points in connexion with the operation itself that are often overlooked, seriously interfering with full recovery: (1) The suture must be of absorbable material; (2) the wound in the nerve must be protected; (3) in wounds in the region of the wrist the deep fascia must be united separately.

1. Fine catgut should be used to unite the ends of the nerves, plain if there is no tension, lightly chromicized in cases where any tension falls on the junction. Non-absorbable material—silk, linen thread, celluloid thread—should be avoided; they give rise in many cases to symptoms months after suture, when recovery is well advanced, causing relapse and seriously interfering with complete recovery. I have recorded one such case³ in which silk was used, and have seen several others. The following is a typical example, in this instance following the use of Pagenstecher thread:

Barbara N., aged 28, was admitted to the London Hospital under my care on April 14th, 1909. On May 15th, 1907, she cut her right wrist, and was admitted a few

hours later to the London Hospital, where primary suture was performed by the house-surgeon on duty, Pagenstecher thread being used as suture material. Slight suppuration took place, and the wound did not heal throughout for eight weeks. Recovery was slowly progressing until three months before admission, when the hand began to get painful, the pain increasing in severity.

When I saw her the hand was held with the thumb in the position it often assumes in paralysis or weakness of the opponens abductor group of muscles, hyper-extended at the metacarpo-carpal joint, and slightly flexed at the metacarpo-phalangeal and inter-phalangeal joints. The opponens and abductor muscles were not acting, but reacting to stimulation with the interrupted current. The skin of the affected portion of the palm was bluish-red, and blisters were present over the terminal phalanges of the index and middle fingers; these had been present fourteen days. Light touches were not appreciated over the whole median area; a prick within this portion of the hand was extremely painful, and the sensation produced radiated widely. In the position of the median nerve at the wrist was an oval swelling, extremely tender, the pain being referred to the full distribution of the nerve.

At operation the day after admission, I traced the median nerve from above and from below into the oval swelling. On making a longitudinal cut into it, I found a cavity containing a celluloid stitch. I then wrapped the nerve in Cargile membrane, and sutured the deep fascia and the skin. The hand was kept slightly flexed on a posterior splint for three weeks. The pain disappeared gradually, and had quite gone when she left hospital, April 26th. Massage was started as soon as the splint was removed. She is slowly recovering, the muscles are acting voluntarily, and there is no pain or tenderness; but it is very doubtful if recovery will ever be perfect.

2. In all cases in which a nerve has been wounded it should be protected from forming adhesions to surrounding structures by wrapping in Cargile membrane. When tendons have been divided they should be treated in a similar way. Failure to protect the nerve is responsible for imperfect recovery in a certain number of cases, and often necessitates a second operation, even when, as in the following case, the nerve was not completely divided.

L. M., aged 16, was admitted to hospital under my care, June 3rd, 1909. On January 2nd, 1909, she cut her wrist with broken glass. The wound was explored within a few hours, and the nerve found incompletely divided. Two months later I saw her, as recovery was not as rapid as had been anticipated. The fingers were in the "ulnar" position, and the intrinsic muscles supplied by the ulnar nerve were wasted and paralysed, but gave the reactions which I consider typical of a certain stage of incomplete division.⁴ Sensibility to light touch was diminished over the ulnar area on the palm and little and ring fingers, and over the last two phalanges of the little finger on its dorsal aspect. It was obvious that the nerve had been incompletely divided below the point at which its dorsal branch is given off. I advised relaxation of the paralysed muscles and massage. In spite of this no improvement took place. By June the wasting of muscles was more marked, and sensibility to light touch was completely lost. On June 9th I operated, and found that the ulnar nerve and flexor carpi ulnaris tendon had been cut into just above the pisiform bone, and were bound up in a dense mass of fibrous tissue. I freed them, and wrapped in Cargile membrane.

There is little doubt that if the nerve and tendon had been protected at the time of exploration recovery would have advanced steadily, and by this time have been complete.

3. After wounds in the region of the wrist the deep fascia should always be carefully sutured. If this is not done the tendons may become adherent to the skin, interfering considerably with their mobility, and in many cases, when the wound has been extensive, a hernia of tendons forms, which is a source of weakness until remedied by operation.

If these three points were remembered in operations upon recent nerve injuries, the percentage of cases of recovery of conduction in the nerve and of complete restoration of function in the damaged part would be much higher than it is.

But operation is only the first step in the treatment of a

case of anatomical division of a nerve. In order to obtain perfect recovery systematic treatment must be carried out for a considerable time, after complete division and primary suture of the median, ulnar, or musculo-spiral; at least twelve months—in the first two probably longer—must be devoted to this. Regeneration of the nerve will ensue if the points I have mentioned be remembered and the wound heal by first intention; but in order that recovery of function may be perfect, the paralysed muscles must be kept relaxed by the application of suitable splints or apparatus, and their nutrition kept up by massage until the restoration of voluntary power, when the splints may be discarded and systematic exercises adopted. The skin must be protected from injury during the first stage of recovery; failure to do this has resulted, in several cases which have come under my care,⁵ in destruction of one or more of the phalanges of the affected fingers.

Failure to carry out muscular treatment must be held responsible for many incomplete recoveries. In my experience it is unusual to find any attempt made to prevent overstretching of the paralysed muscles; it is no uncommon occurrence to see a patient who has had an injury to his musculo-spiral nerve walking about with the typical drop wrist, or a patient being treated by massage after an injury of the ulnar with the fingers allowed to remain in the "ulnar" position. Recovery will never be perfect under these conditions; the paralysed muscles must be kept relaxed until the return of voluntary power. I have seen several cases in which nerve regeneration has ensued, but the limb remains useless on account of the muscular disability resulting from neglect of treatment.

In subcutaneous injuries treatment is imperfect most often in cases of brachial birth paralysis. It often happens that a child of 3 or 4 is brought with a view to operative procedure on account of the persistence of the deformity, and it is found on examination that nerve recovery has ensued, the muscles reacting perfectly to the interrupted current. In these cases it is impossible to tell by inspection what, if any, recovery has taken place, for the over-stretched muscles do not act voluntarily. In some cases the resulting deformity is permanent. In the usual type of birth paralysis (Erb-Duchenne) the limb should be bandaged to the side over cotton-wool and the elbow supported, and should be taken down for massage, passive movements daily, and this treatment continued until muscular recovery ensues, or the occurrence of the reaction of degeneration in the affected muscles renders operation advisable.

There is a form of nerve injury in which the importance of early diagnosis and treatment does not appear to be universally recognized. I refer to the involvement of nerve branches in scar tissue. These cases are often overlooked or treated by massage and various lotions until serious damage has resulted, and prolonged and perhaps permanent disablement is caused.

It rarely happens now that symptoms due to nerve involvement follow a major amputation, for it has become one of the recognized steps of the operation to pull down and cut short the nerve trunks. This is often neglected in amputations of the fingers. During the last two years I have seen eleven workmen who were incapacitated from this cause, and have operated upon six, all of whom were able to return to work within a short time. It is to this form of nerve involvement that I wish particularly to refer.

The symptoms following the involvement of nerve branches in scar tissue and wounds of small nerves were well known to the older surgeons. A very definite train of symptoms follow, which I have discussed elsewhere,⁶ and only wish here to draw attention to those which follow involvement of nerves in amputations of the fingers.

The following is an example of the type of case as it usually presents itself at an early stage.

M. R., aged 18, was admitted under my care on December 7th, 1907. Three months previously the first and second fingers of the right hand were crushed in machinery and were amputated through the middle of the second phalanges. Both suppurated and did not heal for two months. Soon after the wound was healed burning pain was noticed in the middle finger, at first in the scar, later involving the whole finger and shooting up the arm. I found the skin of the whole of the stump of the middle finger red and shiny. The scar itself was extremely tender, and on drawing a needle over the palm of the hand the median area

was hyperalgesic, but there were no changes in the skin. The stump of the index finger was free from tenderness and the skin of normal colour. On December 9th I turned back the old flaps and found the two palmar digital branches spread out over the end of the bone in a fan-shaped manner. I dissected them out and divided them as high as possible, and then removed a little more bone, in order to allow the flaps to meet without tension. Pain was lost at once, and on discharge ten days later the wound was healed, all tenderness had gone from the stump and hand, and the appearance of the skin of the stump was normal.

This was an early and satisfactory case. In many cases, particularly where compensation is in question, hysterical symptoms supervene, but they are by no means confined to cases of this nature. In other cases the muscles supplied by the nerves whose branches are involved are wasted and paralysed, later the pain may spread to other nerves and be complained of in the corresponding positions on the opposite side of the body; lastly, particularly when fruitless operations have been performed, neurasthenia develops.

With regard to treatment, this should be preventive. I have been struck with the number of cases in which suppuration took place. I believe this is due to neglect of Listerian principles. From my own experience, I know that suppuration can be prevented in the large proportion of cases by the judicious use of carbolic lotion. The first aid treatment of a case of this nature should be to surround the part with a compress wet with 1 in 20 carbolic while preparations are being made to thoroughly clean up the surrounding skin. In the treatment of accidental wounds, nothing acts so satisfactorily as an antiseptic as carbolic. While nerve involvement may take place in wounds that heal by first intention, the most severe cases are those in which prolonged suppuration occurred.

In several cases upon which I have operated, the digital nerves have been spread out in a fan-shaped manner over the end of the bone; this with the appearance of the bone led me to think that the bone was divided with bone forceps before the soft parts had been efficiently freed. If bone forceps are used, it must not be until the bone is bare. In every amputation the nerves should be seen and cut short.

When pain and tenderness develop, treatment should not be delayed. The prognosis is good if operation is performed when the pain and tenderness is still confined to the scar or stump; when it has spread to other nerves, or is associated with hysteria or muscular affections, it is by no means favourable, and may, when spread has taken place, necessitate a serious operation—division of posterior roots—before relief can be obtained. Operation should be carried out with a definite object in view, to find and cut short the involved nerves. Reamputation should not be done in a haphazard way. I have notes of one patient who has had four reamputations performed without success, and now has all the complications that can result in this condition.

Sometimes it is possible to feel swellings on the ends of the involved nerves. This may be a help in finding them. In most cases it is best to turn back the old flaps and search for the nerves at the end of the bone. If they cannot be found here, they should be found at the sides of the fingers, traced to their involvement, and cut short. It is only necessary to remove bone when the flaps will not come together again without tension. After closure of the wound the part should be kept at rest until healing has taken place. In few cases will this fail to relieve the pain. If the pain is not relieved, or recurs, no further local operation should be done if the first was thorough. Before proceeding to the only certain treatment in these cases—division of posterior roots—Weir Mitchell treatment must be tried after removal of all cause for worry. It is useless treating advanced cases while compensation proceedings are pending. Weir Mitchell treatment must also be adopted after operation in the cases complicated by hysteria. When muscular symptoms are present, the affected muscles must be kept relaxed by suitable apparatus, until voluntary power returns, and daily massage given. It is often twelve months before muscular recovery takes place.

REFERENCES.

- ¹ Erasmus Wilson Lectures, *Lancet*, March 24th, 1906. ² *Ibid.*, March 31st. ³ *Injuries of Nerves and their Treatment*, p. 77. ⁴ *Ibid.*, p. 40. ⁵ Head and Sherrin: Consequences of Injuries to Peripheral Nerves in Man, *Brain*, Summer Number, 1905, Part CX, pp. 253-50. ⁶ *Injuries of Nerves*, p. 139 et seq.; *Clinical Journal*, June 28th, 1905.