and care. When it is shown that there is complete anatomic discontinuity of the nerve, the bulb or end bulbs should be divided transversely in successive sections, until normal funiculi can be recognized. As the upper end of the injured nerve is often swollen, perfectly good funiculi may appear edematous or glairy. Usually there is fairly active bleeding from the intravenous blood vessels when normal funiculi are reached, and this is especially noted in the sciatic nerve and its branches, and in the median nerve. Usually this can be controlled by gentle pressure, but sometimes fine mosquito forceps must be used and ligation of the vessel with very fine catgut or silk. When the peripheral end bulb is being cut, the ends appear like smooth, shiny scar tissue until a point is reached where there are many normal funiculi without any scar tissue. In section of the central bulb the transition from scar to normal is much more gradual. To prevent rotation of the nerve ends and distortion of the nerve pattern, the epineurium must be grasped a little cephalad and a little caudad to the points where the final sections will have to be made. There is probably a definite pattern and arrangement of the nerve funiculi and even the nerve fibers. Elsberg is studying peripheral nerve operations on the human cadaver and finds in most nerves definite groupings of the funiculi at different levels, often so regular that they can be properly brought together in the suture of the two ends. This should be made without tension, but due consideration should be given to the location of branches. The tension can perhaps be prevented by flexion of adjoining joints. The suture itself is a very delicate operation which is described in detail. If the sutures are well placed a fairly accurate apposition of the ends of the nerve funiculi is possible. All the perineural sutures should be passed before tying. If tied too tightly the funiculi are bent at the ends with resulting poor approximation. Transplantation of nerves to a more superficial level is sometimes necessary, and of this the technic is too minutely described to admit of brief abstracting. We have not yet any definite answer as to how these grafts act. If the condition of the nerve permits it a neurolysis is always better than a resection and suture, and the latter far better than grafting. The era of perfect peripheral nerve surgery, Elsberg thinks, is still to come. The article is illustrated.

McMurray, T. P. TRANSPLANTATION OF NERVES IN GUN-SHOT INJURIES. [Journ. Orthop. Surg., Vol. I., No. 3.]

For some unknown reason end-to-end nerve suture is not always successful, nor is it always possible to bring the ends of divided nerves into apposition. In other cases nerves may be involved in intensive septic trouble with irreparable damage to their structure and function. The grafting of cutaneous nerves to fill gaps in divided motor nerves has been tried by the author and he has concluded that a certain number of patients must be condemned to great disability if procedures involv-

ing the nerves are followed exclusively. Actual loss of muscle substance often nullifies the effects of nerve recovery. In many of these cases tendon transplantation holds out the only hope for recovery of function. In the forearm the muscles which can be transplanted, are the *flexor carpi radialis*, the *flexor carpi ulnaris*, the *palmaris longus* and the *pronator teres*. These may all be used for other functions without the normal movements being disturbed to a great extent. In the case of radial nerve paralysis, the only muscle which will produce dorsiflexion of the wrist, is the *pronator teres* and its tendon must be fixed to both radial extensions of the wrist. The *flexor carpi radialis* has a long tendon and may be brought to the dorsum of the wrist with ease, but the *flexor carpi ulnaris* has a very short tendon necessitating dissection of the muscle from the ulna for about 7.5 cm. Care must be taken that the tendons are not bent at an angle round a hook of bone or the edge of the fascia. For this reason, long incisions are advocated. The *flexor carpi radialis* is inserted into the *extensor brevis pollicis*, and the *abductor pollicis* into the *extensor indicis*. The *extensor pollicis longus* is not included, because extension of the terminal phalanx can be carried out by muscles of the thenar eminence. There are several methods of fixing the transplanted muscle. The author advocates two. In the first method the transplanted tendon is divided, one half is passed above, the other half below the receiving tendon or tendons and the two sections united after passing beyond the receiving tendon. The transplanted tendon is also sutured to the receiving tendons. The second method is to divide the receiving tendons from their muscles and to pass their free ends through the transplanted tendons at different levels. The author lays stress on the necessity of leaving no exposed raw surfaces. The line of suture is closed with two layers. The fingers should never be hyper-extended, but should be put on a splint with about 10° flexion for each joint. Of all transplantation of tendons, that for radial paralysis is the most successful. In this case, however, it is useless to transplant median and ulna muscles which are not strong. In a case of ulna paralysis with complete loss of nerve, the function of flexion in the third and fourth fingers may be restored by suturing the *profundus* and the *sublimis* into similar structures supplied by the median. In complete median paralysis, the *extensor carpi radialis longior* is transplanted into *flexor longus pollicis* by lateral implantation. In the case of deltoid paralysis the author prefers arthrodesis of the shoulder. This enables the patient to make full use of the trapezius and other scapular muscles. In the case of paralyzed quadriceps the author advocates transplantation of both the biceps and the *semi-tendinosus*. The knee is kept straight for about six weeks. In paralysis of the common peroneal nerves, tendon fixation of the *tibialis anterior* and *peronius brevis* gives a good result. In the case of paralysis of plantar flexors of the foot, the *tendo-Achillis* is split into two and one half is embedded in the tibia.