A SUCCESSFUL AUTOGENOUS GRAFT FOR RADIAL NERVE PARALYSIS

CASE REPORT

LEONARD A. TITTRUD, M.D.

Division of Neurosurgery, University of Minnesota Hospitals,
Minneapolis, Minnesota

(Received for publication October 8, 1946)

Functional recovery after the use of transplants to bridge nerve defects in man has been largely unsuccessful except in the repair of the facial nerve in the facial canal. Ballance and Dude are chiefly responsible for the stimulation of surgeons to carry on nerve grafting. They achieved phenomenal success in the use of human autografts for facial nerve defects. Bunnell, and Bunnell and Boyes reported recovery in several cases after the use of autogenous transplants to bridge nerve gaps, especially in the small nerves of the hands and a few in the arms. They favor the use of small-caliber grafts which may be nourished readily by tissue fluids.

In 1929, Foerster reported complete recoveries after employing autogenous nerve grafts in 21 human cases. Whereas Klemme, Woolsey, and De Rezende reported a few successes with preserved homografts in man, Davis7 found that autografting produced better results. Davis and his associates learned that homogenous grafts stimulate more mesodermal tissue proliferation than do autografts, and so the neurofibrosis of homografts have a more difficult process in their growth down through the transplant. Furthermore, they indicated that the viability of a graft depends upon blood vessels growing in from the adjacent tissues; and therefore any structure such as a tantalum or collagen cuff placed about it would prevent its vascularization.

Seddon and Holmes indicated that the neuronal tissue in a homograft becomes necrotic slowly and is replaced by connective tissue. Their 4 cases of homografting in man were failures. Spurling, Lyons, Whitcomb, and Woodhall found no nerve regeneration during a prolonged follow-up study of 8 human cases in which fresh homogenous grafts were used. On the other hand, Seddon, Young, and Holmes observed that a 7.5 cm. cable autograft which was removed 7 months after serving as a bridge in a human median nerve defect had survived and that the Schwann cell proliferation and myelin removal had progressed normally. The neurofibra in the transplant had grown and acquired myelin sheaths as would have occurred after an anastomosis following a simple nerve severance. Most of the clinical evidence available indicates that autogenous nerve grafting in man is much more successful than the employment of homogenous transplants. Autogenous, homogenous, and heterogenous nerve transplantation will lead to functional and organic recovery quite regularly in experimental animals presumably because there is less immunity to the introduction of foreign tissues than is the case in human bodies.

In the literature, there are very few reports of successful nerve grafting in man. For this reason, a case is presented herewith that illustrates that a deficiency in a peripheral nerve may be bridged with a graft and a good functional recovery follow.

CASE REPORT

Case No. 638782. Mrs. M.E.L., a white female aged 32, was admitted to the University of Minnesota Hospitals, Nov. 4, 1941.

History. The patient had a neurofibroma, which she knew had been present for 3 years, removed from the left radial nerve in March 1940. The tumor and about 3 cm. of the attached nerve were excised at the level of the middle and distal thirds of the left humerus. An end-to-end suture of the radial nerve segments was made under tension. A cast was applied after operation to hold the left arm in flexion at the elbow and dorsiflexion at the wrist. The cast was worn for 5 weeks. Her convalescence was complicated by some drainage from the wound. After the wound healed and the cast was removed, a left wrist drop and a complete left radial
nerve paralysis below the elbow persisted. Her past medical history was negative except for the complaint of recurrent hayfever and a healed pulmonary tuberculosis.

Examination. On admission she was found to be in good general physical condition. Chest x-ray revealed a calcified Ghon's tubere at the right base and multiple calcified mediastinal lymph nodes in the right and left hilus. Urinalysis, blood counts, and blood serology were normal. The patient was a brunette, and had numerous deeply pigmented areas of skin over her body and extremities. Numerous small and moderately firm cutaneous and subcutaneous tumor masses were palpable over the surface of the body. These findings suggested the presence of a mild form of neurofibromatosis or Von Recklinghausen's disease.

On the lateral aspect of the left upper extremity was a broad and healed surgical scar, 13 cm. long, extending upward from the elbow. There was no unusual tenderness on palpation in this area. The radial musculature of the left forearm was moderately atrophied. There was a flaccid paralysis of the left brachioradialis, extensor carpi radialis longus and brevis, supinator, extensor digitorum communis, extensor digiti quinti proprius, extensor carpi ulnaris, abductor pollicis longus, extensor pollicis longus and brevis, and extensor indicis proprius. There was no cutaneous sensory loss. In view of the past events, it was believed that a nerve graft would be needed to bridge the gap, and an operation was scheduled with this in mind.

Operation. Nov. 7, 1941. Preoperative medication of nembutal, morphine sulphate, and hyoscine hydrobromide was given. General inhalation of cyclopropane was used for anesthesia during the operation. The old surgical scar on the lateral aspect of the left upper arm was lengthened. The left radial nerve was freed from the scar in which it was imbedded. There were neuromas of the separated nerve ends with a defect in the continuity of the nerve at the site of previous anastomosis. At a level of 1-3 cm. proximal to the neuroma of the central portion of the radial nerve, a large cutaneous sensory branch had its origin. It was believed that this was the dorsal antibrachial cutaneous division. After the scarred ends of the radial nerve were freed, transections were made until normal-appearing fasciculi were evident. The large sensory branch was then dissected free and divided so as to obtain a 9-cm. segment. This was then divided to make two 4.5-cm. cable grafts which were employed to span the radial nerve defect. These two parallel cable grafts were sutured accurately to the proximal and distal ends of the radial nerve with fine interrupted silk stitches which were placed through the epineurium. This was done without tension and a satisfactory end-to-end anastomosis was made. After all bleeding had been stopped, interrupted silk stitches were placed to approximate the deep tissue, and catgut sutures were used subcutaneously. Silk was employed to sew the skin. Sterile dressings were maintained upon the wound with an ace bandage. The left arm was bandaged to the body so as to assure a persistent acute flexion of the elbow in order to prevent tension upon the sutured nerve. The operation occupied 3 hours.

Postoperative Course. Satisfactory wound healing followed, and the patient was discharged from the hospital on Nov. 11, 1941. An area of anesthesia persisted upon the dorsal aspect of the left forearm. For a period of 2 months after operation, the left elbow was maintained in flexion; after this time the elbow was gradually extended until full extension was accomplished in a period of 3 weeks. After this interval, the patient practised active and passive movements of the left arm, wrist, and fingers, in addition to daily massages of the extremity. The left wrist was maintained in dorsiflexion when such physiotherapy was not practised.

![Fig. 1. Photograph April 30, 1946, showing surgical scar on lateral aspect of left upper arm.](image-url)