NEURONAL REGENERATION IN THE CENTRAL NERVOUS SYSTEM OF MAN

SUCCESSFUL GROWTH OF INTERCOSTAL-SPINAL NERVE ANASTOMOSIS AND GROWTH OF INTERCOSTAL NERVE-SPINAL CORD IMPLANT*

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(Received for publication August 19, 1960)

ONE comes into possession of good material of an experimental nature concerning the central nervous system in man with great difficulty. Circumstances operated in an unexpected manner to allow the procurement of an unusual specimen.

A 88-year-old white male was admitted to the Robert Long Hospital of the Indiana University Medical Center on Aug. 15, 1951, with the diagnosis of transverse myelopathy, level of the 10th thoracic dermatome, resulting from a gunshot wound inflicted by police officers on April 1, 1951. It was stated that the missile entered the left side of the back and lodged in the right anterior wall of the chest. Immediate paralysis of both legs was noted, and he was hospitalized near the scene of the incident for several days. He was transferred to another hospital on April 8, 1951, where the missile was removed from beneath the skin of the right chest in the mid-clavicular line over the 5th rib. In addition, a laminectomy of the 10th and 11th thoracic vertebrae was performed on April 10, 1951. It was reported that the missile had completely transected the spinal cord. Later, the patient had calculi of the bladder, which were removed through a suprapubic cystotomy on July 26, 1951. A decubitus ulcer developed over the sacrum. Physical therapy was started to the legs and feet on May 7, 1951. No change in neurological status was noted by August, 1951.

The patient volunteered for experimental procedures that might restore function. He stated that since he had wronged society, he wanted to make retribution. He was granted amnesty from his prison sentence by the proper officials, and admission to Robert Long Hospital was arranged.

Examination. Upon admission, he was in good general health except for a moderate-sized decubitus ulcer over the sacrum and a small one on his right heel. There was a recently healed suprapubic wound, an older incisional wound over the 5th rib on the right, and another midline scar in the lower thoracic spinal region. The upper abdominal reflexes were present, as were ankle jerks. Withdrawal reflexes were present in the lower limbs, but there was no voluntary motion of the legs. Above the waist, the general and neurological findings were within normal limits. All sensory modalities were lost below the umbilicus.

Operation. On Aug. 27, 1951, the old laminectomy wound was reopened and extended upward through the 8th thoracic vertebra and downward through the 2nd lumbar vertebra. At the thoracic 8th and 9th vertebral levels there was dense scar replacing the spinal cord. Oblique skin incisions were made over the 9th ribs posterolaterally. Through these incisions the 8th and 10th intercostal nerves were freed laterally and were sectioned at the axillary line. These nerves, with their central connections intact, were brought back paravertebrally and into the spinal canal. Two of the four nerves were anastomosed with autologous plasma clot to the distal stumps of the severed sacral nerve roots. The diameters of the proximal and distal neural elements were about the same. The other two nerves were implanted into the cephalad end of the conus medullaris through small midline stab wounds, and were held in place by loosely tied 6-0 black silk sutures passed through them and through the thickened pia mater.

Postoperatively, there were spasms of the legs of an increased nature. The course was uneventful, and he was returned to his former hospital on Sept. 11, 1951. Here active physical therapy of his upper extremities was resumed. He had several febrile episodes, attributed to infections of the urinary tract. By mid-December, efforts were being made with therapy to the legs, and progressive wheel-chair ambulation was started. He was quite enthusiastic and related many phenomena

* This work was aided in part by grants from the United States Public Health Service and the National Paraplegia Foundation.
Fig. 1. (A) Silver-stained section through site of suture of intercostal nerve to spinal nerve roots showing continuity of fibers through the area (X60). (B) Greatly enlarged (X450) view taken from section in A, showing fibers of varying size.