Neurosurgical Classic—XIV

ROBERT H. WILKINS, M.D.

Division of Neurosurgery, Duke University Medical Center, Durham, North Carolina

A history of the development of gasserian ganglionectomy and retro-gasserian neurotomy was outlined in the November 1963 issue of the Journal of Neurosurgery, and papers relating to these two operations by Horsley, Hartley, and Krause were reprinted. To complete these early classics of trigeminal surgery, the important 1901 paper by William G. Spiller and Charles H. Frazier is reproduced below.

THE DIVISION OF THE SENSORY ROOT OF THE TRIGEMINUS FOR THE RELIEF OF TIC DOULOUREUX: AN EXPERIMENTAL, PATHOLOGICAL AND CLINICAL STUDY, WITH A PRELIMINARY REPORT OF ONE SURGICALLY SUCCESSFUL CASE.†

BY WILLIAM G. SPILLER, M.D., of Philadelphia
Assistant Clinical Professor of Nervous Diseases, University of Pennsylvania

AND CHARLES H. FRAZIER, M.D., of Philadelphia
Professor of Clinical Surgery, University of Pennsylvania

PART I

BY WILLIAM G. SPILLER, M.D.,
From the William Pepper Laboratory of Clinical Medicine (Phoebus A. Hearst Foundation)

In a paper published in the November, 1898, number of the American Journal of the Medical Sciences, p. 532, I made use of these words: "If it could be shown that the sensory root of the Gasserian ganglion does not unite after its fibres are divided, we should have a fact of great importance. Division of this root would probably be a less serious operation than the removal of the entire ganglion, and might have the same effect in the relief of pain, but the surgical difficulties might be insurmountable. Experiments on animals to determine whether or not the sensory root of the Gasserian ganglion unites after section of its fibres might result in a lessening of the great mortality now existing in operations on the ganglion." Dr. C. H. Frazier has shown that the division of the sensory root may be performed in man, and probably with less danger than the removal of the Gasserian ganglion, as hemorrhage is not so likely to be severe. I should like to lay particular emphasis on the fact that in proposing this operation I did so with much caution. I believe that Horsley is the only one who before Dr. Frazier has divided the roots of the trigeminal nerve without removing the ganglion. Horsley avulsed them at their attachment to the pons, and his patient died seven hours after the operation.1

Frazier has cut the sensory root of the trigeminal nerve in a large number of dogs. Seven of these lived sufficiently long for a study of the nervous system by the method of Marchi. The results of my microscopical examination of the nervous systems from these seven dogs are as follows:

Dog No. 4.—Distinct degeneration by the Marchi method is found in the sensory root at its entrance into the pons, and this degeneration is much more intense in the external portion of the root than in the medial portion, although distinct degeneration is detected also in the latter. The motor root in its intracerebral portion shows slight degeneration. A few black dots are present in the mesencephalic root of the trigeminal nerve. In sections from the medulla oblongata the degeneration is especially intense in the dorsal portion of the spinal root, while comparatively few black masses are found in the ventral portion (see Fig. 1). The Gasserian ganglion and the nerve fibres at each end of this ganglion seem to be normal.

Dog No. 5.—The degeneration of the trigeminal nerve is similar to that in dog 4, only it is more intense in dog 5 (see Fig. 2). Both anterior pyramids show slight degeneration. Much degeneration is found in some of the fibres at one end of the Gasserian ganglion, while those at the other end of the ganglion are normal.

Dog No. 6.—The degeneration of the sensory root of the trigeminal nerve in this case is distinct, but is not very intense.

Dog No. 10.—The degeneration of the intracerebral portion of the sensory root of the trigeminal nerve in this case is very indistinct. The nerve fibres at the central end of the Gasserian

ganglion are much degenerated, while those at the peripheral end are not degenerated. This degeneration at the central end is probably the result of purulent meningitis.

Dog No. 11.—The degeneration of the sensory root of the trigeminal nerve in this case is present, but unimportant.

Dog No. 12.—The degeneration of the sensory root of the trigeminal nerve in this case is slight. Slight degeneration is detected in some of the fibres at one end of the Gasserian ganglion.

Dog No. 13.—Degeneration of the sensory root of the trigeminal nerve in this case is not distinct.

Two of these cases, dogs four and five, were especially satisfactory for microscopical study, while the others presented too little degeneration to permit valuable conclusions to be drawn. In dogs four and five it is evident that the lateral portion of the extracerebral sensory root of the trigeminal nerve was cut, while the median portion was only partially injured. In these cases the dorsal portion of the spinal root of the trigeminal nerve also was more degenerated than the ventral.

I have not been able in these two cases to detect any attempt at regeneration of the sensory root of the trigeminal nerve, but these cases do not disprove the possibility of such a regeneration. The difficulties of technique in determining by microscopical examination a regeneration of the cut sensory root of the trigeminal nerve are considerable. In removing the brains in dogs four and five the slight connection by means of the motor root between the Gasserian ganglion and the pons was destroyed.

It is important to determine whether regeneration of the central nervous system is possible, and with this object in view an examination of the literature is desirable.

Baer, Dawson and Marshall\(^2\) state that, on the clinical side, so far as they were able to ascertain, no satisfactory cases are reported for man of regeneration and return of function after lesions causing the destruction of any part of the central nervous system. These authors do not discuss the histological evidence of regeneration. They conclude from a few experiments cited from the literature that in the lower vertebrates a certain amount of return of function seems to follow a lesion in the central nervous system, while it is not yet decided certainly whether any such return is