PERIPHERAL NERVE INJURIES

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Cutaneous Sensibility in Cases of Peripheral Nerve Injury: Epicritic and Protopathic Hypothesis of Head Untenable. Stanley Cobb, *Archives of Neurology and Psychiatry*, November, 1919.

Supplementary Muscle Movements in Peripheral Nerve Lesions. L. J. Pollock, *Archives of Neurology and Psychiatry*, November, 1919.

Misleading Motor Symptoms in the Diagnosis of Nerve Wounds. A. J. Woods, *Archives of Neurology and Psychiatry*, November, 9119.

Problems in the Diagnosis and Treatment of Injuries to Peripheral Nerves. Elsberg and Woods, *Archives. of Neurology and Psychiatry*, December, 1919.

Overlap of So-Called Protopathic Sensibility as Seen in Peripheral Nerve Lesions. L. J. Pollock, *Archives of Neurology and Psychiatry*, December, 1919.

THE experimental investigation of cutaneous sensation began with the work of Head and his collaborators, 1905–1908. Head, by having the sensory branch of his own radial nerve divided and by carefully following the return of sensation for nearly two years, evolved the theory of "epicritic" and "protopathic" sensibility.

"Epicritic" includes: (*a*) Recognition of light touch, as with cotton wool; (*b*) thermal sensations between 25 and 40° C.; (*c*) localization of cutaneous impressions; (*d*) discrimination of two points (compass test).

"Protopathic" includes: (*a*) Cutaneous pain of all kinds; (*b*) heat above 45°C.; (*c*) cold below 20°C.; (*d*) mechanical stimuli to hairs.

This theory was accepted, found its way into text-books, although the work of other investigators and the recent clinical work on peripheral nerve lesions have pointed out the fallacy of it.

Trotter and Davies, in 1909 and 1913, and Boring in 1915,

found that all forms of sensibility tend to reappear together after nerve division and suture, and that all returning sensation is at first hypoesthetic, gradually approaching normal sensitivity. None of these investigators found the dissociation of areas of epicritic and protopathic sensibility.

Tinel, in his book on nerve wounds, says that we may generally dispense with all minute examinations; exploration with a pin alone supplies all necessary information.

Cobb, in his article, reviews the results of five hundred and forty cases of nerve injury, of which sixty-six were operated on in the United States Army General Hospital, No. 11. His conclusions are that: (1) the epicritic and protopathic hypothesis of Head and his collaborators should be abandoned; (2) dissociations of sensation due to peripheral nerve lesions arise from comparing stimuli not only qualitatively different but quantitatively unequivalent; (3) clinical examinations should be simple and examination for one mode of sensation suffices for diagnosis.

The preservation of certain movements, the loss of which is supposed to follow particular nerve lesions, has been observed for many years. Pollock and Woods, in their articles, attempt to explain the factors which cause these movements. Among these factors, they say, may be included the anastomotic supply of muscles from adjacent nerves, movements produced by muscles other than primary movers in this action, movements occurring as the result of mechanical factors producing a change of direction of leverage by shortening and lengthening of tendons and muscles passing over several joints, and slight movements resulting from the recoil of elastic tissue following a movement in a direction opposite to the one desired.

Elsberg and Woods deal chiefly with the general conditions on which successful treatment of peripheral nerve injuries must depend. They discuss the significance of some symptoms and signs of nerve injury, of some aspects of the finer anatomic structure of the peripheral nerves, and of the anatomic basis and guiding principles for the technic of nerve suture and nerve grafting.

They claim that the value of the "Tinel" sign—the tingling which is observed when the skin is tapped along the course of a peripheral nerve—is doubtful from a practical diagnostic standpoint. They point out that the skin area over which a sensory nerve is distributed varies considerably in size in different individuals. The importance of symptoms and changes in nerves due to ischæmia when blood vessels are blocked off by the pressure of scar tissue is

emphasized and it is a point which has received very little attention by neurologists and surgeons. The fourth point they point out, is that, although a nerve may appear quite normal to the eye, there may be an intranerural blocking of the axons.

In regard to operative interference in peripheral nerve lesions, great importance is laid on the handling of the nerve and the necessity of not doing too much dissection along the course of the nerve in order not to injure the blood supply to the nerve. They divide peripheral nerves into classes: (1) those in which the number of funiculi is small but the funiculi are of large size—the type with large funiculi—and (2) those in which the number of funiculi is large, but the funiculi are of small size—the type with the small funiculi. Regeneration is more rapid and more complete in the nerves with large funiculi than in those with numerous small funiculi. Severe neuralgias and so-called causalgia occur in the nerves with numerous small funiculi, and they suggest that in inflammatory processes in the perineurium, an imitation of sensory fibres is much more apt to occur in a nerve with small funiculi than in one with large ones.

The results of Pollock's investigation criticise only that part of the theory of Head and his co-workers dealing with the temporal dissociation of epicritic and protopathic sensibility. He finds that the early return of sense of prick pain before the return of sense of touch is not due to temporal dissociation of epicritic and protopathic sensibilities, but is due to the assumption of function by adjacent overlapping nerves.

The work of these four authors clearly show that the theory of Head can no longer be accepted; that for ordinary clinical diagnosis in peripheral nerve lesions no fine instruments are needed to arrive at a correct diagnosis; that in operative interference for nerve wounds we have yet considerable to learn before our technique is perfect.