PERIPHERAL NERVES AND HAND FUNCTION

The grasping functions of a hand are dependent, not only upon mobility and strength, but also on the ability of the fingers to feel what they are holding, how they are holding it and how strongly they are holding it.

In his excellent monograph, The Hand, Charles Bell in 1833 emphasised many of these points at a time when surgery could offer little towards the restoration of hand function. His three chapters, “Of sensibility and touch,” “Of the senses generally, introductory to the sense of touch,” and “Of the muscular sense,” still rank with the most valuable a hand surgeon can read.

The development of physiology during the latter part of the last century introduced means to distinguish between different modalities of cutaneous sensibility. Methods of examination were developed for identifying these modalities. These methods have ever since dominated the neurological examination of sensory function. The extensive work to identify specific receptors in the skin for different modalities led to elaborate theories on the anatomical construction of the receptor system in the skin, which became accepted almost as facts. Progress in surgical technique made nerve suture, too often regarded as synonymous with nerve repair, possible. The results of nerve suture to restore sensory function were described in terms of these tests, developed by physiologists not for this purpose but in order to study receptors.

Sensory recovery after nerve suture was often considered to be satisfactory or even excellent, in terms of these accepted standards. It is to Seddon and his co-workers, who have done more than any others in our time to promote peripheral nerve surgery, that we owe the important distinction between this “academic” recovery and “functional” recovery. “Academic” recovery is judged by the response to the conventional tests for touch and pain, and these neurological methods have been generally considered satisfactory for assessing also the functional value of hand sensibility. This is an entirely different approach from the one always accepted when dealing with other nerve functions. When the sight has to be tested it is felt necessary to find out what the eye can see. When we wish to determine improvement or impairment of the function of the ear we are trying to find out what the ear can hear. When, however, results of nerve suture in the arm and hand have been discussed, it has been exceptional for the examination to go beyond the current tests for the modalities of touch and pain. Function itself has hardly ever been tested.

The same standards have been used to study sensory return to grafts and flaps. The influence of remaining receptors in the bed, of unavoidable but harmful microneuromas, as well as of receptors in the normal skin margins surrounding the transplants has rarely been studied. Conclusions, entirely unsatisfactory from the functional aspect, have been reached.

It has been shown by Walshe, Weddell and many others that the postulated anatomical structures for different modalities seem to be non-existent in the sense which used to be generally accepted. Walshe has stressed that “it is not the least of Woollard’s services to science to have redressed the balance between anatomy and physiology in the study of sensory function.” Today it must also be questioned whether the sum of the hitherto known modalities is equal to the sensibility as a whole, because it appears that sensibility is a far more complex function than was previously thought. It must now be accepted that the high quality of sensory function which makes it possible for fingers to “see” is a most important issue for hand function, and the current neurological tests for touch and pain cannot tell if this function is present. They cannot distinguish accurately between paraesthesia and sensibility. Paraesthesia, which means low threshold and abnormal response, is not the same as useful sensory function. Paraesthesia may be of value for protection but will never enable a part of a hand to perform a precision-sensory grip. Return of a lower quality of sensory function or, for example, non-independent intrinsic muscle function, can of course still be of value when a more perfect result cannot be obtained. And so, it must be confessed, our present
methods of sensory assessment remain gross and highly unsatisfactory despite the progress that has been made. Improved standards must be found for assessing recovery of nerve function.

It is a welcome sign of progress that in this issue problems are investigated which previously had been regarded as solved. Bowden and Napier suggest tests in order to "provide a simple, repeatable and objective method of assessing prehensile function of the hands as a whole" after peripheral nerve injuries. The article by Mackenzie and Woods shows that of fifty patients in whom the median nerve was sutured at wrist level with the best surgical technique available today only some 50 per cent regained useful function. It may be doubted whether a single one has regained anything close to normal function. Several of the causes of failure are clarified. The paper by Tubiana and Duparc deals with methods other than nerve suture for restoring lost sensory function in the hand, an interesting way to sidestep the nerve problem.

Improved standards will no doubt give rise to improved methods for examining the functional value of peripheral nerve surgery. Better methods of surgery will certainly follow.

Perhaps truth still speaks in the words of Bell when he says "Surgeons, from becoming practically acquainted with a greater number of the phenomena on which physiology is founded than physicians, have perhaps superior opportunities of advancing that science." If it is so, the opportunities must be used.

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REFERENCES


