THE TREATMENT OF PAINFUL PHANTOM LIMB BY REMOVAL OF POST-CENTRAL CORTEX*

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The phenomenon of phantom limb was probably first recognized and has very likely been seen most frequently by military surgeons. Am- broise Paré recorded the condition clearly in 1551 when discussing amputations in *La maniere de traicter les playes faites tât par hacquebutes, et cetera.* But it was not until 1871 that Weir Mitchell published his article "Phantom limbs" in *Lippincott's Magazine of Popular Literature and Science* and gave us this perfect term which has since had universal usage. He wrote:

A person in this condition is haunted, as it were, by a constant or inconstant fractional phantom of so much of himself as has been lopped away—an unseen ghost of the lost part, and sometimes a presence made sorely inconvenient by the fact that while but faintly felt at times, it is at others acutely called to his attention by the pains or irritations which it appears to suffer from a blow on the stump or a change in the weather.

In the following year he published his book *Injuries of nerves* and made further observations after studying 90 patients. He not only gave us the details of the various phenomena which the patient experiences in the absent member, but he made very important observations which can be used to explain the sensory ghost and its misbehaviour. He noted:

If we paradis-ade the track of the nerves in or above the stump, we may cause the lost fingers and thumb to seem to be flexed or extended, and, what is most remarkable, parts of which the man is conscious, but which he has not tried to stir for years, may thus be made to appear to move to his utter amazement. . . . In a case of amputation at the shoulder joint, in which all consciousness of the limb had long since vanished, I suddenly paradised the brachial plexus, when the patient said at once, ‘My hand is there again. It is bent all up and hurts me.’ It is of course impossible that the motor nerves stimulated should convey any impression centrally, and we must therefore conclude that irritation of sensory trunks may occasion impressions of muscular motion in the sensorium.

The phenomena of the phantom vary in nature and in incidence. Weir Mitchell found that 95 per cent of patients experience phantom limb after amputation, Pitres 97 per cent, Leriche 98 per cent and Foerster 100 per cent. Riddoch noted that pain was referred to the phantom in half of all amputated limbs, but Foerster claimed that pain was experienced in every instance. In our patients it has been almost literally true, as Foerster observed, that pain was felt in every phantom, but it was disabling in very few.

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*Read before the eleventh annual meeting of The Harvey Cushing Society, New York City, May 20, 1942.
† Loc. cit. I. 59a. "Car les patients long temps aprés l'amputation faicte disent encore sentir douleur es parties mortes & amputées: & de ce se plaignent fort, chose digne d'admiration, & quasi incroyable à gêts, qui de ce n'ont expérienc. Parquoy se fait donner garde, que tel sentiment ne nous retarde à faire le deboir de la parfaite curatio: comme quelque fois l'ay veu couper en membre à deux ou à trois fois: pour s'etre ar- resté audit sentiment faux & menteur."
The sensations occur much more frequently in the hand than in the foot. They may appear immediately or, more frequently, not until two or three weeks after the operation, although occasionally as long as a year or more may pass before the syndrome develops. Usually only the distal part of the amputated limb is felt, such as the hand or foot, although the whole arm or leg has been removed. In the course of time the phantom recedes and ultimately comes to be attached to the stump. It may move voluntarily or in-voluntarily; it may be in a constantly cramped state of painful contraction. Frequently it assumes the position of the limb at the time of the amputation. Wounds and parts of the limb previously painful are experienced in the phantom as they were beforehand.

The unpleasant sensations may include undue warmth, itching, or simply the distress due to overconsciousness of the painless phantom. These discomforts may be intermittent but if severe are usually continuous. They are then described as a dull ache or as burning, throbbing, piercing, cramping, sticking, cutting pains. Many patients suffer a deep, agonizing torture due to the sensation of the limb being very tightly compressed, which may be so severe that the victims are willing to undergo any kind of treatment. It has not been unusual for a dozen or more operations, principally amputation of terminal nerve stumps, to have been performed on one patient. Many ultimately have become morphine addicts.

The treatment of the painful phantom has been such an unsatisfactory and disappointing experience that there are very few detailed reports in the literature. Most discussions concern generalities rather than specific records, which is natural, since failure has been the common story. Foerster recorded some of his experiences in 1931 in his paper "Division of the anterolateral tract in man." Two patients with painful phantom fingers whom he treated by high cervical chordotomy and one with a painful phantom foot by upper thoracic chordotomy had only very temporary relief of pain in the phantom. In 1935 he reported five more cases. Two of these had phantom hands and division of all cervical and upper thoracic posterior roots on the side involved gave only transitory relief. Another patient whose arm was amputated at the shoulder was relieved for "eight years" by division of the anterior and posterior roots C-4 through Th-5; "permanent" relief was obtained by another man with a phantom lower limb after dividing the anterior and posterior roots Th-10 through S-5. In a final patient with amputation at the shoulder the posterior roots C-4 through Th-4 were divided and the cervical sympathetic chain was removed including the middle cervical through the second thoracic ganglia. He remained free from pain for many years. Foerster remarked that the combination of posterior root division with removal of the sympathetic trunk was effective in several other cases but did not give details.

No one else has reported the results of combined operations of these types but Leriche used sympathetic interruption, surgical or by infiltration anaesthesia, with some success. The effects lasted for a period of only weeks