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## AUTONOMIC CONTROL

Psychosomatic medicine has not become a separate specialty in this country, and even the more moderate claims of its devotees have met considerable criticism or disbelief, perhaps because the physiological mechanisms involved have been little explored. Nevertheless, there can be few clinicians who are unaware of the role which emotional disturbance can play in the precipitation and aggravation of somatic disease, and especially is this so in diseases of the skin. But, though emotional disturbances are common, they do not usually cause skin lesions, which are relatively rarer. Therefore the skin has been considered to be particularly susceptible to emotional disturbances in these cases. The techniques of treatment employed—abreaction with ether, carbon dioxide, or methylamphetamine—are physical methods which affect the autonomic nervous system, and the psychotherapy given at the same time may be small. It is possible to infer therefore that pathological changes in the skin may be primarily due not to emotional disturbance but to faulty reaction in the mediating vegetative nervous system, somewhere between higher brain centre and peripheral vessels. Shorvon and his co-workers<sup>1</sup> appear to have recognized this possibility, as they noticed that some successful results were obtained by “non-specific abreaction.”

The commonest clinical entity in which there is nervous disturbance of vegetative function is manic-depressive psychosis. Here there are marked temporary alterations in peripheral autonomic functions: in the circulation, in sweating, in gastro-intestinal and sexual activity. At the same time there is a dramatic and shattering disturbance of mental function, much more devastating in its effect than any physical disturbance which can reasonably be attributed to psychic inefficiency. While this psychosis has been firmly

ascribed to an inherited nervous instability,<sup>2</sup> the actual site of the disturbance has never been demonstrated, though it is reasonable to place it within the higher autonomic centres. Indeed, typical manic symptoms may occur in close association with small lesions confined to the hypothalamus.

What is now known of central autonomic regulation? Considerable work has been done in investigating the nervous control of the blood vessels.<sup>3</sup> Abrupt alterations in vascular tonus, nervous in origin, can occur in response to various stimuli—pain or cold, a sudden loud noise or “startle” stimulus, or even a purely psychological change. Because of the bilaterality and uniformity of response and because of the marked adaptation that follows repetition of a given painful stimulus it was for long thought that the resulting vascular contraction was entirely central in initiation and depended on the integrity of thalamic and hypothalamic structures. Carmichael<sup>3</sup> has demonstrated, however, that these responses can be obtained from areas innervated by an isolated section of spinal cord. More recent work<sup>4</sup> has shown that this local reflex can be demonstrated in normal subjects, and it is clear therefore that some autonomic regulation takes place at the level of the spinal cord.

Some integration of autonomic functions also takes place in the medulla. But the more complex control of the sympathetic and parasympathetic nervous system is vested in the hypothalamus. Tumours in this region produce pathological sleep or hunger, obesity, amenorrhoea, hypertension, or, occasionally, paroxysmal autonomic storms which Penfield<sup>5</sup> has termed diencephalic epilepsy. Recent work on hypothalamic control over both the autonomic nervous system and the endocrine glands was reviewed not long ago.<sup>5</sup>

It is, however, only during the last few years that the role of the cortex in controlling autonomic functions has been fully recognized, and its importance has been underlined by the successful treatment of mental illness by neurosurgery. While leucotomy is often helpful in mental states in which psychological tension is the main aetiological factor, it is becoming clear that it has a specific effect chiefly in depressive illness, especially of the involuntional type, which is often characterized by impairment of autonomic function. The anatomical studies of Le Gros Clark in this country, and the exploitation of the technique of physiological neuronography by McCullough and others in the United States, have indicated the extensive nature and complexity of the cortical and sub-cortical areas which are thought to be involved both

<sup>1</sup> *British Medical Journal*, 1950, **2**, 1300.

<sup>2</sup> Slater, E. O., *Proc. roy. Soc. Med.*, 1936, **29**, 981.

<sup>3</sup> Carmichael, E. A., *Brit. med. Bull.*, 1950, **4**, 351.

<sup>4</sup> Elithorn, A., Piercy, M. F., and Crosskey, M. A., *J. Neurol. Psychiat.*, 1951, **14**, 209.

<sup>5</sup> Harris, G. W., *British Medical Journal*, 1951, **2**, 559, 627.

<sup>6</sup> Meyer, A., and McLardy, T., *J. ment. Sci.*, 1949, **95**, 403.

<sup>7</sup> *Res. Publ. Ass. nerv. ment. Dis.*, 1950, **29**, 775.

<sup>8</sup> *The Cerebral Cortex of Man*, 1950, New York.

in the control of autonomic responses and in the elaboration of emotional feelings. It is now known that the temporal horn and the posterior orbital surface of the frontal lobe are closely interconnected both directly by the uncinate fasciculus and indirectly through the hippocampal-fornix system. Again, the temporal and the frontal regions are in intimate relation with the hypothalamus. Similarly the cingulate gyrus, which is believed also to subserve autonomic function, is connected with the hypothalamus by way of the thalamic nuclei. It is the dorsomedial nucleus of the thalamus which characteristically shows secondary degenerative changes following successful leucotomies,<sup>6</sup> and it is now generally accepted that this region is an important link between subjective emotion of cortical origin and autonomic function controlled by the hypothalamus. Unfortunately direct evidence, from stimulation in man, of cortical areas which influence autonomic function is still very scanty. Livingstone<sup>7</sup> has demonstrated changes in blood pressure and in the respiratory rhythm following stimulation of the posterior orbital region, and Penfield and Rasmussen<sup>8</sup> have elicited autonomic responses from the lower end of the motor cortex and from the subjacent island of Reil, an area that is anatomically closely related to the posterior orbital region mentioned above. Other workers, by varying the rate and strength of stimulation, have succeeded in producing lacrimation from areas that customarily produce eye movements, and salivation from the same area as movements of mastication. Autonomic responses elicited by this type of stimulation are crude, as are somatic motor responses to stimulation. Probably many regions of the cortex are in fact capable of originating an autonomic response, but the adequate stimulus is likely to be a complex and specific pattern of neuronal activity, and it is not surprising that even in the conscious subject large cortical areas remain unresponsive to electrical insults, however carefully the voltage, frequency, and duration of the stimulus are controlled.

Present knowledge thus supports the hypothesis that there is a primary autonomic motor area similar to the motor cortex, closely related to it anatomically, and probably extending down through the Sylvian fissure on to the posterior orbital surface. Just as complex motor actions are organized in association areas relatively unresponsive to stimulation, so then are there likely to be areas predominantly concerned with the elaboration of the autonomic effects accompanying emotion. Some of these areas are almost certainly in the anterior regions of the frontal lobes.

## SCIENTIFIC STUDY OF DELINQUENCY

As psychology has ventured into the sphere of conduct and behaviour, at one time considered to be the preserves of free will, problems of delinquency have come under the scrutiny of scientific investigation. The oft-debated question whether crime is a disease, which Samuel Butler brought to the fore in *Erewhon*, will now provoke the answer that sometimes it is and sometimes it is not. And scientific study enables us to distinguish types of crime not only according to the nature and seriousness of the offence, as the law does, but according to the cause of it in the individual and society. The emphasis has passed from study of the delinquency to study of the delinquent, from the crime to the criminal, from his act to the motives for his act.

The mental defective or epileptic who commits acts of violence is in a different category, for instance, from the man who commits the same crime because he has been brought up with no respect for social values or because he prefers to earn his living that way. Psychological treatment is not the primary need of the latter. In a third category, and one less well known to the public, are those people who commit offences under the influence of an obsessional compulsion. They are often of otherwise good character. The schoolmaster and the magistrate are often baffled by the discovery that thefts from boys' lockers have been committed by the most conscientious and scrupulous pupil, and the public is usually scandalized when it learns of the homosexual lapses of some highly respectable man. Such delinquents are themselves bewildered and embarrassed by these propensities in themselves, so opposed to their normal character and so contrary to their will, and on discovery they are filled with remorse. They may desire punishment to expiate their crime, but this has no lasting effect. Such conditions can often now be cured or at least alleviated.

Less understood, and for that reason worth careful attention, is the group of "reaction delinquents." These, unlike the last group, are defiant in their delinquency but yet, like the last group, often come from good homes. Typical is the man who, unwanted and unloved as a child, reacts by suppressing all desire for love and becoming anti-social, resentful, and rebellious. In early years he is the difficult child, in adolescence he may become the delinquent, and in later life the criminal. He has no remorse, and remains defiant. Punishment, instead of improving his condition, makes him worse, for it increases his resentment and sense of grievance. The more these