THE NEURO-PSYCHOLOGICAL BASIS OF CONDUCT DISORDER

MORISON LECTURES BY DR. R. G. GORDON

The Morison Lectures, under the auspices of the Royal College of Physicians of Edinburgh, were delivered by Dr. R. G. GORDON of Bath, a Fellow of the College, on June 17 and 18. Dr. Gordon took as his subject "The Neuro-psychological Basis of Conduct Disorder."

In his first lecture he premised that conduct disorder would depend upon one or more of three principal factors: (1) an interference with the functional integrity of the body; (2) a similar interference with that of the mind; (3) an environment pressing too hardly upon the individual or demanding too much of his unaided effort. The angle from which he proposed to discuss the subject was one not usually taken in current polemics—namely, the abnormal event which was taking place in the nervous system of an individual when performing an unusual or asocial act.

Modern psychology held that the dynamic basis of behaviour was emotional, and that when behaviour was erratic or ill adapted it was because there was an incoherence in the emotional reactions. It was necessary to understand the neurological basis of emotional life and those functions of the brain which subserved affective experiences. The knowledge of the working of the brain was increasing rapidly; old conceptions of localization were being revised and corrected almost every day. It was beginning to be realized that in many respects the brain worked as a whole, but that certain areas possessing cyto-architectural structure and arrangement had the duty of organizing and controlling special functions. "However much we study the brain as a whole we must not forget the function of its parts, and however much we study the parts we must not forget the function of the whole."

It was not only in the cortex that new knowledge of functional localization was being obtained. The centres in the diencephalon and mesencephalon, which concerned in the one case the various autonomic activities and in the other the tonic variations in skeletal musculature, were known, and in the thalamic area there were known to be centres which played an important part in the affective life of the organism.

Disturbance of Control

In the realm of abnormal behaviour, according to modern psychiatry, it was distorted and confused affective impulses and reactions that were primarily concerned, and distorted ideas and conduct were secondary to these; therefore it was clear that disturbances of diencephalic and mesencephalic function or control must be explored if these conditions were to be interpreted on a neurological basis. The lecturer was careful to point out, however, that the majority of examples of conduct disorder were reversible—that is to say, they did not represent permanent changes in character. It was an alteration of function, not of structure, that had taken place, and therefore the clue was likely to be found, not in the diencephalic centres themselves, but in the inhibitions and releases impinging upon them from above. Moreover, it was behaviour disorders of an essentially cortical nature which were being investigated, and consequently it must be determined exactly how cortical influences were conveyed to the diencephalic centres and vice versa. Here was one of the most noticeable gaps in exact neurological knowledge. Very little was known of the anatomy and physiology of cortico-autonomic connexions.

It was convenient in psychological discussion to speak of cognition, affection, and conation, and if the brain were thought of as divided laterally by the central sulcus rather than longitudinally, the neurological correlates to

this grouping could be to some extent envisaged. Behind the central sulcus was the receptive area of the brain, the parietal, temporal, and occipital lobes subserving not only the areas for the reception of common sensation, but also the areas concerned with the integration of these sensory impressions into images. Here the lecturer briefly discussed the possibility that the hinder part of the brain might be regarded as the correlate of cognitive activity, though any such division was to some extent misleading, because at these high levels the brain worked as a whole, and in order that the ideas derived from visual or auditory imagery might be expressed the effector frontal or pre-central part of the brain must be brought into play. In front of the central sulcus were areas largely effector in function, and this part therefore might be correlated with conation. It was difficult to demarcate affective and conative behaviour from one another, so that if a central area of brain comprising the thalamus, hypothalamus, and their cortical connexions was regarded as essentially subserving affection, it must also be thought of specially in relation to the prefrontal area, which, as Kuntz said, "plays an important role in the emotional drive which is a major factor in much intentionally directed effort."

Excitation and Inhibition

Dr. Gordon went on to point out the importance of realizing that two functions were to be observed when stimuli reached the cortex—namely, excitation and inhibition. Pavlov in his studies on conditioned reflexes had pointed out that when a stimulus reached a certain point in the cortex a widespread radiation of excitation might ensue, followed by an antagonistic radiation of inhibition, which would ultimately limit the field of excitation to a strictly defined area. The generalized convulsion illustrated the more or less unlimited radiation of excitation, and sleep the more or less unlimited radiation of inhibition.

Some people were less capable of inhibition than others, and it had been suggested that this relative defect was due to faulty control of higher neuronic structures over lower ones. An important factor in determining conduct disorder was a failure of the inhibition and regulation demanded by the social code, and it was possible that when two brothers were brought up in exactly the same domestic environment and under the same code the reason why one of them became a thief and the other did not, given apparently the same set of stimuli, was that in respect of a particular pattern the relative irradiation of excitation and inhibition was different. That acquired and inherent emotional attitudes differed in individuals, even in twins, was obvious, and therefore it was not surprising that the thalamo-cortical patterns should show wide variation in their susceptibility to excitation and inhibition, and consequently that the choice of one out of a multitude of possible responses to a situation should not always be the same.

Organic Factors

The lecturer expressed his belief that by far the greatest number of cases of conduct disorder in children were due to psychological and environmental causes. In a series of 200 "conduct" cases no organic factor could be discovered in 76 per cent. Even in cases in which there was a prominent organic factor this was by no means the only operating cause. Indeed, it might be said that the organic cause merely loosened the controls or unbarred the gates so that an uncoordinated emotional drive easily carried the individual into abnormal behaviour.

A boy of 8 was brought to him for regular nocturnal enuresis. Clinical examination suggested the presence of a spina bifida occulta, x rays disclosed an absence of the sacral laminae, and it seemed reasonable to assume that the enuresis was due to an early malformation of the regulating sacral centres, and that therefore not very much could be done. There were, however, certain circumstances in the home and a typical attitude of petulant despair on the part of the mother

which made him suspect an emotional factor, such as was at work in the vast majority of cases of enuresis. The boy was taken into hospital and improved under treatment. Then the situation was carefully explained to the mother that the boy had less power of control than most children of his age owing to congenital abnormality, and that it was of the utmost importance that the home environment and her attitude towards him should be scrupulously correct. She co-operated reasonably well, with the result that the bed-wetting occurred only now and then and the frequency of these accidents was steadily if slowly diminishing.

In his opinion the same kind of thing happened in most conduct disorders; more than one factor was operative, certain influences weakened the control and disturbed the integration, while others fired off the unchecked emotional disturbance which determined the homicide, assault, theft, or whatever it might be. Were it not for integration and control by higher levels of personality every threat to the person would result in precipitate flight, every thwarting of desire in violent assault, and every stimulus to the acquisitive instinct in theft. The problem was not so much why a theft was committed as why it was not prevented, what had interfered with the normal integration of the personality. The answer was in the interference with the proper integrative action between the cortex, both receptor and effector, and the affective mechanisms of the thalamus.

Conduct Disorder Due to Epidemic Encephalitis

Disturbance of the orderly sequence of response was well illustrated in conduct disorder due to epidemic encephalitis. It was probable that in certain sequelae of encephalitis vascular changes occurred which became more or less permanent lesions, interfering with normal cortical control, and especially upsetting the physiological relationships between cortex, thalamus, and hypothalamus. Such lesions would readily account for the temper outbursts, the change in affections, and the mischievous behaviour as opposed to normal conduct. In the encephalitis case the passage from stimulus to response was interrupted and confused by the organic lesions, and yet it had been shown that careful training, suitable occupation, and freedom from conflicting and inappropriate stimuli would do good even in these cases and prevent the worst manifestations of conduct disorder. Where one particular behaviour manifestation was persistent it was worth considering whether in the environment there was an undue weight of stimulus for this instinctive reaction. If outbreaks of temper were the characteristic manifestation it would be well to ensure for the child as non-irritating an environment as possible, although in many cases this might not make much difference.

Dr. Gordon closed his first lecture with some remarks on chorea, in which behaviour disorders were by no means uncommon, though usually of a minor character. Choreic children were jerky in mind as well as in body. He cited one fatal case, which was investigated microscopically. It seemed clear from this case, which was typical of others, that while the main incidence of trouble was upon the thalamo-striate and midbrain regions, the cortex, with the exception of the pyramidal projectant system, might be considerably and seriously involved. It might be assumed, therefore, that there was a considerable interference with general cortical control, and especially with the cortico-thalamic apparatus, and it was not surprising that these children were excitable, restless, subject to outbursts of temper and crying, for the proper sequence of response to stimuli was interrupted and diverted by the lesions which were scattered more or less irregularly through the brain.

The Epileptic Personality

In his second lecture Dr. Gordon considered the condition of epilepsy. Epilepsy, he said, was a biological

defect and rendered the individual incapable of adequate social adaptation, so that the adult reactions became necessarily abnormal. The epileptic was solitary, selfish, and incapable of the normal affections. He showed egotism, morbid sensitiveness, and poverty of ideas. He was often moody, with periods of lethargy, alternating with outbursts of hastiness.

This "personality" might quite frequently be recognized, and was not seldom guilty of conduct disorder or the subject of some form of psychoneurotic reaction. It was a manifestation of a special type and degree of cortical inefficiency. Among the effects of this inefficiency was the occurrence of epileptic convulsions, but these depended also on other factors, and might, and often did, arise in the life history of individuals who did not manifest this personality. While it seemed likely that the effector area of the brain was not altogether normal, such a personality might be a highly integrated egocentric individual, with great intellectual capacities, though with a defective power of social adjustment; the extreme example was the epileptic Napoleon. As a rule, however, the epileptic personality manifested, in addition to egocentricity, a lack of general control, irascibility, temper outbursts, and emotionalism, suggesting a failure of the controlling or inhibiting function which the higher levels of the cortex exerted on lower level activities.

In the symptom of epilepsy, whether fit or its equivalent, the projectant elements involved were in a state of undue sensitivity or irritability, or an undue number of cells were receiving stimuli from the afferent division of the nervous system, or there was an imperfect inhibition or control by higher levels in that system. Probably in most cases all three factors played a part. The first probably depended on biochemical changes involving either cells or synapses. The second might be a factor which was responsible for many forms of psychogenic conduct disorder, and not only psychogenic epilepsy; and the third was of importance in traumatic (Jacksonian) epilepsy, when controlling cells had been destroyed, but might also operate when normal cortical controls were inhibited.

The crime which might be committed in the phase of epileptic automatism was in rather a different category. The process was really the same as that which took place in the somnambulistic dream.

A boy of 18 was a popular and successful member of a public school. He was in his last term and was about to leave to go into a satisfactory job. Without warning or apparent reason he began to create serious disturbances in the dormitory at night. He would begin by talking in a cheerful but bombastic way, and presently would get out of bed with the avowed purpose of protecting some small boy. If anyone opposed him he responded with considerable violence, with the result that it was necessary to isolate him and have him watched at night by a male nurse. He had no recollection whatever of this behaviour and no clear recollection of dreams. Psychological investigation showed a somewhat deep-seated feeling of insecurity, which had no doubt been helpful in pushing him on to the achievement of success in school, but was stirred unduly when the change to the uncertainties of a business career was imminent. In waking life, with full cortical function, such deep-seated impulses were controlled and repressed, but in light sleep when higher cortical patterns were incapable of preventing lower emotionally charged impulses from breaking through, these somnambulisms took place. In these the inner conflict was dramatized. He saw himself as the insecure small boy, and also as the brave hero striding through all opposition to the protection of that other self.

In this and another case he described he thought there was evidence of the three factors—the lack of proper cortical integration and control, the mass discharge of stimuli from the perseverated emotionally charged idea, and the spread of excitation and withdrawal of inhibition from certain violent aggressive behaviour patterns.

Conduct Disorder in Mental Deficiency

Cases of conduct disorder in mental deficiency were not nearly so common as the laity supposed. Cyril Burt had found that of juvenile delinquents whom he had tested with the Binet-Simon tests only 8 per cent. were mentally defective. In a large institution for mental defectives the lecturer had found less than 4 per cent. of 1,000 consecutive admissions noted as "morally defective." Many of the low-grade cases screamed and kicked when interfered with in any way and were consequently difficult to examine, but this seemed to be a perseverated fear reaction. A stethoscope or tendon hammer was interpreted in their "one-track" minds as an implement with which they were going to be hurt. The really low-grade cases were quite incapable of planning any coherent asocial act, and in the higher-grade cases the same lack of planning ability was noticeable, though coherent behaviour was more possible, so that while the defective did not take the initiative in delinquency he might give trouble as a result of persuasion or suggestion by others.

In any case of asocial conduct in the defective it seemed that integration and inhibition were imperfect, and the response to any relevant stimulus too direct and uncontrolled. This might mean a sudden reaction, as when a defective was thwarted in his desire and hit out at all and sundry, in which case he might commit an aggravated assault, but this was quite easy to understand and was simply a direct uncontrolled and immediate instinctive response. Dr. Gordon cited two cases of his own in which there was not so much an impulsive sudden response to a stimulus as a stupidity of action which failed to weigh consequences.

A deformed dwarf of low mentality earned a pittance by taking in a little laundry. Her one passion in life was affection for her sister's baby. One day she was given the baby to mind, and put it into an empty clothes-basket as a convenient cradle. The infant began to cry, and thinking he was cold she decided to cover him with some of the clothes which she had been washing. This idea seemed to persevere in her mind, as she continued to pile on clothes until the infant was suffocated. There was no doubt that she would not deliberately have hurt a hair of its head. She was tried for murder, but on the testimony of Professor Berry and himself pronounced guilty but insane.

Generally speaking, the conduct disorder of the mental defective might be taken as being due to the too direct response of primitive behaviour patterns not far removed from instincts consequent on the poorly developed power of inhibition. This prevented the individual from exerting a normal selection of a socially desirable response to a relevant stimulus or of inhibiting an "easy" response even to an allied but not strictly relevant stimulus. The deficiency of inhibition depended on a failure of development or an early destruction of cortical neurons, resulting not only in a paucity of their numbers but also, what was more important, in an irregularity of their arrangement and the formation of a cortical area lacking the differentiation appropriate to the adult brain.

A Transition Group

The transition from the case of conduct disorder which might justly be attributed to organic changes in the brain to the case of purely psychical origin might be illustrated by what the lecturer described as the biochemical group. He mentioned the case of a girl who had been found guilty of persistent stealing, but only of sweets or of money to buy sweets. She was found to be suffering from definite hypoglycaemia, and on being put on regular supplies of glucose both the physical and the moral trouble cleared up.

It was well established that centres in the diencephalon controlled the carbohydrate metabolism of the body, and especially the level of the blood sugar, and low blood

sugar created a tension or disturbance in the diencephalic centres which was in turn transmitted to the effector areas in the frontal lobe. It was not of course true that every person with hypoglycaemia stole sweets, but who should say what conditioning might take place in the upbringing of children? A pattern of behaviour was here being established for whose activation the chief stimulus was apparently the hypoglycaemia.

From biochemical needs to biological needs was no far cry. Again to take the dream as an illustration, explorers had related how when deprived of food they were apt to dream of succulent beef-steaks and well-browned welsh rarebits. In the sexual dream the imagery no doubt owed just as much to the messages transmitted to the cortex from an overtense vesicula seminalis as the increased tension of the vesicula and consequent reflex emission owed to the sexual image. The same mechanism emerged in relation to fear, anger, and other instinctive reactions.

Bodily tensions were thus seen to be determining the activation of cortical patterns which were largely ideational and affective in the dream, but these might easily pass over into conative patterns, as might happen in hysterical somnambulism, fugue, and double personalities. In these states as a result of dissociation inhibitions were lifted and centres of excitability were allowed to radiate more freely than when the personality was fully integrated. "Presumably Mr. Hyde is only Dr. Jekyll let loose."

Psychological Types of Conduct Disorder

With regard to psychological types of conduct disorder the lecturer maintained that the great majority of those who committed such asocial acts were not obviously psychotic, or even psychoneurotic, and if the attempt were made to classify them into the clinical groupings such as hysteria and anxiety and obsessional states the issue would not be greatly clarified. The key to the situation was usually to be found in some quite obvious condition (as C. H. Town had stated) "in that complex unity built up by the individual in his interrelations with the home, school, street, church, playground, club, and all other institutions and individuals making up his world."

It was obviously desirable, therefore, that in young children stimuli which were likely to evoke undesirable responses should be avoided. As the child grew older the impulses—or instincts, if that word was preferred—became adjusted to each other and to the demands of the environment until a system of ideals and internal inhibitions to the outside world had been built up and began to serve as a means of self-regulation of conduct. What exactly determined the inhibition or lack of inhibition in a given pattern was not exactly known.

"That it depends on the biochemical changes involving release of acetylcholine at the synapses may be taken as reasonably certain, and we are beginning to find that certain substances . . . have an effect on this process, but we are as yet in ignorance of the influences which determine wholesale, but at the same time coherent, inhibitions or releases. As has already been said, the irradiation of excitation or inhibition may be due to inherent factors or acquired influences, whether psychogenic or due to organic causes, but the same process would seem to be at work in these psychogenic cases from the neurological point of view as in all the other types of conduct disorder. Whatever be the origin of the disturbance we must confess to a great deal of ignorance of the details of the underlying neuronic process. In this respect we must admit that so far histopathological methods are inadequate to answer this question."

In thinking of conduct disorder the brain must be regarded as acting as a whole. Localized lesions could only be "disorders of mental tools," though there was no reason why these mental tools should not continue to be studied, for thereby it was possible to understand how the brain worked as an organ and how mental function

described by psychology depended on neuron function described by physiology. Dr. Gordon discussed the different kinds of intercommunication between the various parts of the entire system of thalamo-cortical functional areas, and spoke of the thalami as the principal switchboard of incoming sensory messages. The thalami might well be assigned a functional role congruous with their central anatomical positions in the central nervous system. The thesis he had presented in his lectures seemed to require that they be functionally regarded as organs contributing largely to what Sherrington had termed the integrative action of the nervous system, and this conception seemed useful in assisting the understanding of the neurological basis of conduct disorder with its undoubted affective drive, thus linking up the findings of modern psychology with those of modern neurology.

In conclusion, he said that if in these lectures he had disclosed yawning gulfs in exact knowledge and had proved nothing, he hoped he had stimulated interest and had encouraged the expectation that one day the two great subjects of neurology and psychiatry might be welded into one harmonious whole. This, indeed, with the increased knowledge of these two subjects, was the presumed purpose of the Morison Lectures.

INTERNATIONAL TECHNICAL CONFERENCE ON AERIAL RELIEF

The following report has been received from Colonel E. M. Cowell, D.S.O., of the Surrey Branch of the British Red Cross Society.

The League of International Red Cross Societies, in conjunction with the Hungarian Red Cross, have recently held their first International Conference at Budapest. Twenty-five nations, including Great Britain, and fifty organizations took part. Two British Monospar machines, three French Caudron biplanes, and an Italian three-engined converted bomber (Caproni) proceeded to the rendezvous by air. The journey of 1,225 miles from the Air Port of Croydon was most enjoyable, and took about ten hours of actual flying.

The objects of the conference were an exchange of ideas, reports on practical experience, and demonstrations of actual air medical transport work. Papers on various aspects of air ambulance work were read by French, Dutch, Polish, and British representatives. Two papers, by a French and an Italian delegate respectively, on the medical importance of the parachute were of great interest. Colonel Ferroni of the Italian Medical Service showed many lantern slides of air work in Abyssinia, with especial reference to their method of dropping food, clothing, and medical supplies from the air by parachute. The loads dropped averaged 120 kilos in weight.

One day was devoted to demonstrations on the aerodrome at Budapest. The first competition consisted in bringing in by air ambulance patients waiting at an aerodrome ninety miles away. In this event the British Monospar was only four minutes slower than the larger Italian machine. Great attention was paid to dropping supplies by parachute, and the enthusiasm of the onlookers was aroused when four Hungarian Red Cross nurses made a graceful parachute descent from 6,000 feet. Previously two French doctors had demonstrated the safety of this method of landing.

The conference teaches the medical profession many useful lessons. In France there are some 200 doctors who have qualified as pilots and are capable of flying their own ambulance machines. Certainly all young doctors in this country should acquire first-hand knowledge of air transport, even if they do not go on to become pilots. The safety and value of air medical transport is now realized by all. It remains for the medical profession in this country to accept this and translate their air knowledge into practice whenever occasion arises. The profession is urged not only to become air-minded but air-worthy also.

LONDON AND COUNTIES MEDICAL PROTECTION SOCIETY

The annual meeting of the London and Counties Medical Protection Society was held, under the presidency of Sir CUTHBERT WALLACE, on June 16. A tribute of respect was paid to the memory of the late Dr. R. L. Guthrie, for several years treasurer.

The Year's Work

In moving the annual report, Sir Cuthbert Wallace said that 1,169 new members had been elected during the year, and the membership now stood at 15,135. One-tenth of the membership made application for advice and assistance during the year, and nearly 800 cases were dealt with by the solicitors. As president of the Society and studying the cases which continually came before the council, the complexity of the modern operation had been brought home to him from a new angle. In the old days the surgeon, without an anaesthetic or with very little anaesthetic, would perform an amputation in ninety seconds, but nowadays the operation might be a very long business, and, moreover, it was no longer the responsibility of one man but of a team. The responsibility of the anaesthetist and of the nurses would have to be defined at some time or other. The surgeon could no longer go on bearing all the risks entailed.

In dealing with the work of the year Sir Cuthbert Wallace mentioned the alteration of its articles recently made by the Society in order to meet the situation which might be created by the Law Reform (Miscellaneous Provisions) Act, 1934, whereby it was possible for actions to be taken against the estate of a deceased doctor in regard to some act or fault during his lifetime. The wisdom of this decision on the part of the Society was shown in a recent case (that of Connolly v. Rubra, reported in the *British Medical Journal* of December 5, 1936, p. 1174) in which for the first time the estate of a deceased doctor was sued, £5,000 damages being awarded, and the decision being sustained on appeal. The Society had been able to assist the widow, and he thought the action taken whereby the privileges of membership were granted to the personal representative of any deceased member was an excellent instance of intelligent anticipation. Moreover, the benefits of membership had been further extended to provide life membership for those members who had retired from practice.

Financial Position

Mr. W. M. MOLLISON, the new treasurer, said that for the first time in recent years the accounts of the Society showed a deficit amounting to £246. This was due largely to the heavy expenses in the case just mentioned and to other cases. The total cost per member was £1 5s. 7d., which was considerably more than the subscription received, the difference being made up by interest on investments and accumulated balances. It was very important to get more members into the Society, and even more important that members should as far as possible exercise circumspection in dealing with patients in matters which might have a legal bearing.

Sir Cuthbert Wallace was unanimously re-elected to the presidency, the nineteen vice-presidents were also re-elected, as were the retiring members of Council, with the addition of Dr. Marguerite Kettle, and votes of thanks were accorded to the staff and to the legal advisers (Messrs. Le Brasseur and Oakley). Dr. C. O. Hawthorne, in speaking to a vote of thanks to the president, suggested that greater efforts should be made to bring to the attention of young medical graduates the need for joining a defence organization.

In their report to the Society the solicitors drew attention to the need for keeping professional records. The absence of these had been an embarrassing feature of a case which the Society had fought, unsuccessfully, during the past year. Members who were insurance practitioners, they said, would avoid much anxious labour and trouble at a later date if they made systematic entries on their record cards, particularly of visits paid to patients. All pertinent correspondence should also be kept.