All the more so if at the time of examination no physical signs are discovered. A similar emotionalism occurs also in pseudo-bulbar palsy, progressive bulbar palsy, chronic alcoholism, dementia paralytica, and occasionally with cerebral tumours, but by the time it appears, clear indications of structural damage can usually be found.

Lastly, the apathy of Parkinsonism, which is often more apparent than real, may be wrongly interpreted as psychogenic. But quite apart from the unmistakable physical abnormalities, even in early cases, which are now common knowledge, the lack of emotional reaction should in itself lead one to suspect its organic basis.

In conclusion, while the analysis of symptoms and signs is of the utmost value in the subject under discussion, the investigation of the behaviour of the individual as a whole in the past as well as in the present is the basis upon which diagnosis has often to rest. Let us not forget, too, that a neurotic may develop organic troubles like other people, and also that a person may become mentally unstable as the result of anxieties consequent upon physical disabilities. In this respect, minor head injuries ought especially to be remembered.

DIFFERENTIAL DIAGNOSIS OF ORGANIC AND FUNCTIONAL NERVOUS DISORDERS *

BY

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The differential diagnosis between functional and organic nervous disease is obviously a wide subject. At the outset an exact definition is needed as to what constitutes functional nervous disease. Broadly, this may include all nervous manifestations in which no evidence of pathological changes in the nervous system has been demonstrated. Cases of dysfunction without demonstrable organic lesion may therefore be classed among the functional cases, and disturbances resulting from psychological stresses in the highest psychic level will also need to be included. The symptoms of the diseases commonly known as the neuroses or psychoneuroses will, of course, come under review, as will some of the psychoses. While some psychoses, such as general paralysis, have a very evident organic basis, others represent derangement of function, and little objective organic evidence may be obtainable.

The association of so-called functional elements with organic lesions raises an even wider issue. Cases in which no functional element was apparent before an organic lesion developed bring up the whole question as to the relation between these groups, and as to how far they can be justifiably separated. The attempt may be difficult, as may be judged from the fact that a leading neurologist stated, in discussing hysteria, that there were few organic symptoms which he had not seen reproduced in that disease. Functional disorder of the nervous system may disturb any bodily system and lead to confusion with diseases other than those of the nervous system, and separating the functional incapacity in a given lesion from that due to organic disease may be very difficult. In a short paper it is obviously impossible to deal with all aspects, but I shall endeavour to show the importance of examining the problem as a whole, and of not neglecting the psychological approach.

* Read in opening a discussion in the Section of Neurology, Psychological Medicine, and Mental Diseases at the Annual Meeting of the British Medical Association, Bournemouth, 1934.

Consideration of the person's whole make-up and circumstances often renders the diagnosis clear when individual symptoms may be very puzzling. Recognition of a hypochondriacal attitude of mind is of great importance in the valuation of symptoms. This abnormal concentration on the individual's own body represents a psychological abnormality, whether it is present as a simple neurosis or whether associated with a depressive or paranoid psychosis.

Neurasthenia

As I am approaching the subject rather from the functional point of view, I shall first consider the different aspects of the neuroses. While hysteria and its subsidiary, the traumatic neurosis, perhaps provide the principal problem, neurasthenia and anxiety neurosis, and the various mixed types, also need consideration. By neurasthenia I mean the exhaustion neurosis, in which the patient shows marked mental and physical fatigability.

The individual is usually a limp, sparsely nourished, unhealthy-looking person, unable to concentrate, finding all exertion, mental or physical, too great. If attempting to perform a physical act he rapidly tires, and he becomes increasingly inefficient when faced with a mental task. Special tests prove this to be a feature of a genuine case. Such a state of affairs exists to some extent after any great and debilitating illness, but the conditions persist in the neurasthenic long after the recuperation would have taken place in the normal individual.

The presence of anaemia, tuberculosis, or any chronic associated factor must of course be eliminated, and then arises the question of some chronic toxæmia. The teeth and intestines fall under suspicion, sometimes rightly, but at times drastic measures in regard to these are adopted without avail. Sometimes the case is one of incipient melancholia, the loss of interest and disinclination to exertion being a stage in the depressive phase of a cyclothymic or manic-depressive psychosis. What is at first regarded as a post-influenzal debility, and then as neurasthenia, may ultimately prove to be the early stage of a depressive psychosis. Usually, however, the associated depression, as opposed to a limp apathy, differentiates between them. Too much listless apathy and indifference to external circumstances would, on the other hand, arouse the fear that the case was really one of schizophrenia, but the pure neurasthenic is not given to fantasy, "day dreaming," and other features of the praecox case. Although the fatigability of the muscles in myasthenia gravis to some extent suggests neurasthenia, it is not common to confuse the condition. The facial muscles are usually quite mobile in neurasthenia, and there is no paralysis of groups of muscles such as the orbicularis palpebrarum or palatal muscles. The acute symptoms of encephalitis lethargica are hardly likely to be confused with neurasthenia. The dulling and immobility of mind of the encephalitic might be confused with a neurasthenic or depressive individual, but the mask-like rigidity and salivation so common in the former are quite uncharacteristic of the latter. The dull immobility of the praecox syndrome, possibly associated with salivation, is far more likely to be confused with the effects of the encephalitis lethargica, and confusion has at times arisen. The encephalitic, however inhibited, is more fully alert, given time to express himself, while the praecox is actually confused, and no amount of time allowed for expression will improve matters. The mannerisms and wrinkled forehead of the praecox are usually distinctly different from the mask-like face of the encephalitic. Mentally, variability and inconsequence, or perhaps stupor, will contrast with the slow, inhibited endeavour to find expression. This slow,

hesitant expression may perhaps resemble the retarded melancholic, whose furrowed facies contrasts with the encephalitic. Genuine acute depression is sometimes added to the encephalitic syndrome. A full recognition of the mental and physical wreckage that the disease has brought may cause the individual to feel that death is the only solution to his difficulty. Suicide is a real risk in such cases, which are sometimes very logical in their depression.

The older type of neurasthenic presents other problems. Such cases are not obviously of the type of which it has been said that their vitality has been squandered by their ancestors. In other words, the predisposing congenital element is less evident, and one seeks other causes. Real mental and physical strain may have preceded a collapse, and the toxins of alcohol, tobacco, etc., may have influenced them. When the stress reaches breaking-point quite a sudden collapse may occur in these cases. Eliminating the more obvious alcoholic syndromes, neurosyphilis should be remembered as a possible cause. A neurasthenic attack in the middle-aged should always be regarded with suspicion, particularly if the patient has not previously shown tendencies of this type, and signs of neurosyphilis should be looked for and the serological findings tested if there is doubt.

Anxiety States

The varied manifestations of the anxiety states perhaps provide more difficulties than other syndromes owing to the variety of the symptomatology, and also owing to the fact that the patient is obviously so sane and so genuinely affected by his symptoms. Fear and apprehension is the prevailing feeling of the individual, who is in a general state of excitation. Many symptoms suggest sympathetic stimulation. Some symptoms, however, suggest disturbance of the parasympathetic supplied through the vagus, and while the names vagotonia and sympathicotonia have been applied to the different conditions, the symptoms are so frequently mixed in type that it is better merely to say that they represent functional disturbances of the autonomic nervous system.

Closely allied are the vasovagal attacks, in which the patient exhibits a sudden sense of oppression, usually starting with an epigastric sensation, followed by dyspnoea, and disordered action of the heart and even a sense of impending death. Similar symptoms are observed in the acute or paroxysmal phase of the anxiety syndrome, and when, as rarely happens, consciousness is lost, the condition may even suggest epilepsy. It is, however, much more likely to suggest some other cause for fainting, and may even be mistaken for some cardiac condition such as coronary thrombosis. The patient usually merely fears he is about to lose consciousness; he is in a state of acute fear and apprehension, and may fall over slowly, clutching at things as he falls, and making every effort to regain control. There is not the careful disposition and dramatic effect seen as in the true hysterical fit, the patient being genuinely distressed.

At times the condition may suggest a minor cerebral attack, as the patient may complain of a feeling of congestion in the head or say he feels as if his head were going to burst. The pulse is rapid, and may even seem inhibited, but irregularity apart from cardiac disease is, in my experience, not usual. Respiratory attacks, with a breathlessness resembling air-hunger, may also be a feature of the acute attack. A study of the interparoxysmal symptoms and of the psychological basis will help to make diagnosis clear. Where there is obvious sexual excitation without relief, faulty methods of contraception, leading perhaps both husband and wife to seek advice, or general causes likely to lead to anxiety, the

nature of the case becomes clearer. The interparoxysmal symptoms, although more likely to resemble diseases of other systems, will help in elucidation. The disordered action of the heart with precordial pain, and no evident organic lesion, so commonly seen during the war, is a common symptom. Sweatings of the palms may occur, and this may be more generalized. The tremor, combined with the rapid cardiac action, may suggest exophthalmic goitre, with which the condition may, indeed, be associated. Symptoms of intestinal disorder have been referred to, such as eructation, vomiting, various results due to irregular peristaltic contractions, and diarrhoea, even with tenesmus—all symptoms of the fear syndrome, and aptly illustrating the well-known phrase, "Their bowels were turned to water."

In some cases the psychological basis may be less evident, and abnormal vagal stimulation on the lines of oculo- and gastro-cardiac reflexes appears to result from gastro-intestinal movements. At times abdominal manipulation will make the patient realize that the origin of the vague discomforts and sensations complained of lies in movements of the gut. Between the anxiety syndrome and the hysteric occurs anxiety hysteria, a definite neurosis, in which are classed those whose hysterical reaction mainly expresses itself in mental anxiety symptoms. Apart from this, mixed types occur in which it may be difficult clearly to separate the anxiety and hysterical symptoms.

Hysteria

The hysteric is the classical simulator of many diseases, but much time and trouble might be saved if more effort were made to study the patient as a whole, instead of concentrating upon individual symptoms. To deal with a hysteric much study of the patient's immediate and remote situation is necessary, but an accurate appreciation of the immediate situation will often enable a quicker and more accurate diagnosis to be made than if the approach had only been from the physical aspect.

Some hysterics are first seen in the psychological department of a general hospital, while others arrive there with a dossier from all the other departments, elusive symptoms having been followed from system to system. The family doctor is in a particularly favourable position to see and appreciate the family situation, which is the basis of the faulty reaction. At times, by judicious advice, he may alleviate the intolerable situation which is being shirked. Hysterical symptoms represent an idea of the patient tending to satisfy the subconscious purpose. The nature of the symptoms may be determined by the type of disability most useful to obtain that end, or in case of a traumatic neurosis by an original injury to that part. The lesion is usually a loss of function, but is associated with the general petulant emotional reaction of a hysteric. Such lesions may occur either on the psychological or on the physical plane. Among the former may be mentioned the amnesias, fugues, cases of double personality, and also the stupor, while the latter will show sensory and motor changes—that is, anaesthesia, hyperaesthesias, and, on the motor side, convulsions and palsies.

Dealing first with convulsions, a case of major epilepsy seen in a fit is probably the simplest problem. The hysteric seldom produces the different stages of the fit at all realistically, and still less the post-epileptic confusion and coma. A well-described true aura is also against a diagnosis of hysteria. In the post-epileptic state extensor plantar responses would negative hysteria but not epilepsy. To some extent the general mental make-up will help to differentiate the childish and probably dull and irritable epileptic from the petulant but quicker-witted hysteric. In some cases this will not help

particularly in the very difficult problem of the hysterical epileptic—that is, the epileptic with hysterical manifestations. Where obvious attacks of true major epilepsy alternate with equally obvious hysterical outbursts, little difficulty arises, although an observer who has only seen one or other group may be deceived. Rarely, epileptics can simulate genuine fits to an extent which can deceive, and I have known a hysterical epileptic have realistic "pseudo-fits" at a demonstration. It is usually, however, the combination of petit mal with hysterical manifestations which deceives, and until some indication of the epilepsy, such as unexplained bed-wetting, occurs, the real nature of the case may be missed, always remembering that even these symptoms have been counterfeited by hysterics. The many other causes of convulsions are more likely to be confused with epilepsy than with hysteria, but an unexpected fit without previous history may arouse suspicion as to a functional origin.

Some Causes of Convulsions

Among the other causes of convulsions may be mentioned conditions causing intracranial tension. Fast-growing tumours are unlikely to be confused, as the evident signs of pressure develop, but slow-growing tumours in which signs of pressure develop slowly may cause confusion. In a case in point of one of these slow-growing tumours, an oligodendroglioma produced the first fit, for which the patient was invalided from the Navy seventeen years before death.

Localization by mental symptoms is not reliable owing to the variability of these symptoms, which may occur even in subtentorial cases. Tumours of the frontal lobe, and perhaps of the corpus callosum, are, however, more apt to be associated with early mental symptoms than those in other areas, and deterioration and dementia may occur even before signs of pressure make the nature of the case obvious. At times such a dementia may be associated with dysarthria, causing general paralysis to be suspected in what is really a frontal tumour syndrome. Confusion and deterioration occur in cases of Pick's and Alzheimer's diseases, as well as in cases of cerebroarteriosclerosis, where temporary confusion from a recent vascular lesion may be added to a permanent deterioration. In all the above cases convulsions may occur which need differentiating from epileptic or hysterical manifestations, and similar convulsions may occur with alcoholism, and certain cerebral poisons such as lead, mercury, etc. The convulsions due to metabolic disturbances must be remembered, such as uraemia, eclampsia, and hypoglycaemia, and, in childhood, disturbances associated with infection, rickets, and teething, which last may represent the earliest signs of epilepsy.

A further convulsion which may need differentiating from epilepsy or hysterical convulsions is the fit associated with tetany. In one case, a woman of about 30 years, who had had a partial thyroidectomy for exophthalmic goitre, developed fits of a tetany type, some of which developed into generalized convulsions. Her blood calcium was low, but improved to normal under treatment with calcium and parathyroid. Her fits became less and less suggestive of tetany, and more characteristic of genuine epilepsy.

Convulsions can also occur in disseminated sclerosis, but it is not in this way that the disease is usually confused with hysteria. It is in the early stages that the variable losses of power with remittent tendencies occur, which cause the diagnosis to be at times in doubt before evident signs of the organic lesion develop. The reaction of the disseminated case is at times not unlike that of the hysteric, and hysterical symptoms may even be added to those due to the organic disease. Generally, the paraplegia is more suddenly and dramatically complete in

a hysteric, whereas other organic symptoms will be evident in the disseminated case, presenting a complete spastic paraplegia.

Motor and Sensory Disturbances in the Hysteric

Hysterical paralysis may affect any of the senses or limbs, or a combination of limbs. The lesions most commonly met with are probably paraplegia or monoplegia of an upper limb, and aphonia. The hysterical paraplegia leads to a complete incapacity, necessitating the care and eliciting the attention and pity that the hysteric desires. In the poorer classes it may lead to admission to a hospital, and so cause a removal from irksome home conditions. Signs of organic lesion will, of course, be absent, although disuse phenomena may occur later. Control of organic sphincters will usually be retained, although at times lack of control of these functions may occur which may be accompanied by neglect of person. Usually, however, apart from the lesion complained of, conduct will be excellent, and the individual will suffer as little inconvenience as possible, consistent with the lesion. Sensory loss may or may not accompany the paralysis, and when present may help with the diagnosis, owing to inconsistencies incompatible with an organic lesion. The underlying psychological idea of a paralysis may at times be traced, as in the case of a girl with a monoplegia of an upper limb which she had used to repulse her lover when he attempted liberties, the paralysis representing subconscious regret that she had so repulsed him. Usually the diagnosis is not difficult, the paralysis being limited to a movement or limb. When a movement is taking place, apparently with great difficulty, marked contraction of the antagonistic group of muscles will be evident, as well as contraction of the primary movers, which would not occur in a genuine paralysis. If rigidity is present investigation increases it, and endeavouring to overcome it provokes emotion from the patient. In gait, the tendency of a hysteric is to call attention to his lesion by dragging the limb, whereas the paralytic endeavours to compensate for his deficiency by circumduction. Similarly, tremors increase on observation and cease when attention is distracted to other parts.

The movements known as tics are commonly attributed to automatic or habit spasms, possibly associated with a local irritation or stimulus. At times, and in their early stages, they represent definite symbolic movements on the lines of a compulsion neurosis, the performance of which satisfies the unconscious wish whose emotional effect has been transferred to the symbolic act. The treatment of such cases is difficult, but tracing the tic to its origin, where this is possible, should release the pent-up affect attaching to such symbolic movements. Sensory loss without paralysis is much less usual in hysterical patients, although hyperaesthesia may be complained of as a means of eliciting sympathy. The hallucinatory disturbances of cutaneous and organic sensations seen in some of the psychoses are complained of in more general terms as burning or electrical sensations, and not as painful points or definite specified hyperaesthetic areas. Further, the depressed cyclothymic patient has a very different general reaction, and, although in certain phases the schizophrenic may resemble the hysteric, his reaction is essentially introverted, and he is unlikely to obtrude his symptoms.

Hyperaesthesia and other disturbances associated with dyspareunia due to some sexual incompatibility are important, as the whole group of symptoms is readily understood when the underlying attitude is revealed. Such symptoms mainly cause confusion with minor gynaecological conditions, and range from simple complaints of pain to elaborate hypochondriacal ideas with abnormal

paranoid trends. They include real cases of abnormal sexual incompatibility, ranging down to cases which have failed to adjust in regard to contraception, with fears of pregnancy, and menopausal cases, where one of the parties has ceased to desire sexual relations. An appreciation of this saves much investigation of elusive symptoms.

Coming to the special senses, blindness, deafness, and loss of speech may all occur. Elaborate tests to deceive the senses have been evolved to prove the functional nature of the cases. Unilateral blindness is perhaps more usual; conjunctivitis is not uncommon, being easy to produce and resulting in a similar incapacity. Aphonia, where phonation is lost but articulation is preserved, is the common hysterical lesion, as the patient can still converse in a whisper, again suffering incapacity without great inconvenience. The partially adducted state of the vocal cords is characteristic. The adoption of face-saving methods in inducing speech by faradism facilitates cure of this symptom.

Mutism is more generally a sign of stupor, although it may occur in persons fully alert mentally, but silent owing to hysterical or delusional ideas. Among the common causes of stupor may be mentioned post-epileptic phenomena, depressed cyclothymic cases, hysterics and schizophrenics, and cases of so-called idiopathic stupor. Somnolent cases of encephalitis lethargica may resemble this state, and cases of pathological somnolence or narcolepsy, some of which may be associated with organic lesions, such as cerebral tumour. Among the rarer conditions may be mentioned such a phenomenon as cataplexy, a condition in which movement is impossible, although consciousness is retained. While some of such cases have a physiological basis, many on investigation will be found to be cases of hysteria.

Without an adequate history, differentiation between the conditions may be difficult. The principal difficulty is in separating the cases of hysteria from the praecox syndrome. The hysterical type, fully alert to her surroundings, who, under suggestion or other suitable conditions, passes into a hysterical trance, is usually obvious, but when extended periods of stupor, with few if any remissions, occur, with marked dissociation, the fear will be that the case is one of serious schizophrenic dissociation, even when mannerisms and other suggestive schizophrenic symptoms are absent.

In conclusion, I would again repeat that neglect of the psychological aspect leads to failures in diagnosis and treatment, owing to undue emphasis being placed on the individual symptoms. When both physical and mental aspects are considered, a true perspective is obtained, with beneficial results both to doctor and to patient.

With the July issue of the *Fortschritte auf dem Gebiete der Röntgenstrahlen* began the fiftieth volume of a monthly periodical which has rendered very great services to radiology the world over. Founded in 1897 by Heinrich Albers-Schönberg, who was himself a radiological pioneer, it has given publicity to many of the outstanding discoveries in connexion with x rays, and been a foster father to various of the subsequent journals which dealt with the more specific applications of this subject as they came into being. It has been adopted as the official organ of radiological societies in Czechoslovakia, Austria, Hungary, and Russia, as well as in Germany, and has won universal recognition as a sound and reliable as well as a progressive periodical. It is only right that the July issue should begin with the first Albers-Schönberg memorial lecture, which was delivered at the congress of the German Radiological Society in Baden-Baden last April. The present editor is Professor Rudolf Grashey-Köln.

MECHANICAL TRANSMISSION OF TRYPANOSOMIASIS, LEISHMANIASIS, AND YAWS THROUGH THE AGENCY OF NON-BITING HAEMATOPHAGOUS FLIES

(PRELIMINARY NOTE ON EXPERIMENTS)

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In this preliminary communication it is not intended to review and discuss fully the immense literature on experimental and field observations regarding the direct transmission of trypanosomes, leishmania, and other blood-inhabiting organisms. It is proposed, however, to emphasize the important part which may be played by non-biting haematophagous flies in the mechanical dissemination of blood-inhabiting organisms, which appears hitherto to have been largely overlooked.

Most authorities are in agreement that, apart from cyclical transmission through the agency of tsetse flies, direct methods of infection by *Tabanidae*, *Stomoxys*, and other biting flies play an important part in the active spread of trypanosomiasis. Thus Duke (1919, 1921, 1923) believes that the sleeping sickness epidemics which sweep over certain parts of Africa are due to mechanical infection from man to man by tsetse flies; and Hornby (1921) states that the direct spread of trypanosomes among domestic stock is by no means uncommon as the result of the introduction of an infected animal into a clean herd living in a tsetse-free area. Wenyon (1926), in summing up the evidence on mechanical transmission, says it has been clearly demonstrated that a purely mechanical infection may occur by a biting fly contaminating the wound it inflicts with infective blood which it has recently taken into its proboscis from another host.

Earlier Observations on Fly Transmission

In proportion, however, to the amount of research that has been undertaken on direct transmission, the positive experimental evidence that has been brought forward incriminating these biting flies is so meagre as to suggest that the mechanism of this method of transmission is not fully understood. It was concluded so recently as 1933, at the conference at Entebbe on the tsetse and trypanosomiasis, that further information based on experimental work was necessary to elucidate the problem of mechanical transmission.

Work on the transmission of the tissue-inhabiting pathogenic protozoa by Diptera other than the biting species, *M. domestica* in particular, is on record, though the observations are scanty. Castellani (1907) fed *M. domestica* and allied species of flies on scrapings from yaws which contained *Treponema pertenue*, and afterwards, by transferring them to scarified sores on monkeys, produced an infection in one of the experimental animals. The flies were kept in position on the sores of the monkeys for two hours. Darling (1913) reported mechanical transmission of *T. evansi* (*T. hippicum*) to animals through the agency of house-flies which infested the open sores on mules in Panama. Laveran (1880) first suggested that oriental sore in Biskra might be due to transference of infection by flies, and Wenyon (1926) stated that it was highly probable that the house-fly, which swarms round