CLINICAL SURVEY AND RESULTS OF 200 CASES OF PREFRONTAL LEUCOTOMY.*

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Since the introduction of leucotomy by Lima and Moniz in 1936 numerous authors have reported their experiences with this form of treatment in mental disorders (Freeman and Watts, Fleming, Mayer-Gross, Hemphill et al.). Although leucotomy has stood the test of time well, and all workers agree that in selected cases its application is well justified, so that it has become an established form of treatment, there are many obscure clinical aspects which require elucidation. It is obvious that the collection of observations from as many angles as possible is necessary in order to further research in this promising field. It is hoped that a report on the results of leucotomies performed in this Hospital will be a contribution to that end.

Before going into detailed analysis of the case-material, one has to meet one or two methodological objections to the present-day customary clinical psychiatric research. These are: first, that the intangible complexities and imponderabilia of a personality, the all-important developmental and individually unique psycho-drama on the psychological plane, get lost in the maze of clinical descriptive terms, mass observations and statistics. This seems to me irrefutable. It is salutary to recall, I think, that Freud, for example, arrived at his epochal discoveries by studies of individual patients, and was bold enough to build upon those observations a psychopathology, a psychology, and a metapsychological theory. The dynamic psychoanalytical discipline thus founded still remains an unrivalled method for disentangling symptoms psychologically, and for understanding some of the meaning of the contents of psychoses. Despite the frowning misgivings with which statisticians question the permissibility of, for them, useless terms such as emotional.

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ambivalence, libidinal cathexis, and so forth, as too vague, psychoanalysis obstinately refuses to budge before the anathema of the modern number-wizards. All this has practical clinical implications too; psychiatric clinicians should not mesmerize themselves, as it were, by brandishing numbers.

The indications for leucotomy should be put forward, not only after a clinical descriptive classification of illness and assessment of chances of spontaneous recovery, but also after painstaking investigation of the quality of the present and past personality, and the social environmental situation into which the patient will be discharged on his eventual recovery. The possibility must be kept in mind also, that a psychosis might be the last act of a psycho-drama; meaning that a constitutional personality with its own peculiar, developmental, and instinctual response subconsciously chooses psychotic surrender as a solution for some insurmountable conflict on a different plane of psycho-biological existence.

The realization that the response of the personality to brain injuries is markedly individual and cannot be predicted by any clinical criterion or any other rule of thumb method is essential; quite apart from the apparent fact, which Alfred Meyer has demonstrated so impressively, that in almost every operation of leucotomy, topographically different fibres are cut, owing to lack of exposure of the operative field and inexactitude of skull markings.

John S. Muller, the great physiologist, once said that "every organ has its own language and a key to it." To apply this metaphor, the language of the brain expresses itself in the psychic manifestation of the whole personality which responds to the brain as a holistic entity. Both structure and function are holistic: function affects structure—as seen in the speedier disappearance of deficiency symptoms after brain damage by appropriate psychological reablement—and structural changes influence, of course, function. Such principles of a holistic neuropathology, as propounded especially by Goldstein and his school, should put a stop to the futile and confusing "revivalist" tendency to find the seat of the soul in some localized cell or fibre constellation of a particular part of the brain. That is why, I think, the projecting of psychological conceptions, such as the super-ego, into neuropathological mechanisms is fraught with the danger of confusion, even if it is suggested as a heuristic assumption only.

The next fundamental difficulty of psychiatric mass observation and assessment of results is the almost hopeless "Tower of Babel" confusion of descriptive psychiatric nosology. Alienists seem to be very zealous pupils of their patients in finding neologisms for the naming of diseases and in creating autistic systems of clinical classification of their own, which they foster with great narcissistic pride. A basic standardized psychiatric terminology is imperatively needed if clinical psychiatrists are ever to achieve common ground.

The enumeration of possible fallacies in this type of paper, unfortunately, does not eliminate them or render the investigator immune from them. The only excuse for its shortcomings is that during the war years the really desperate shortage of doctors and auxiliaries, such as social workers, nurses, etc., made sufficiently exhaustive collection of information wellnigh impossible.
CASE MATERIAL.

The cases are those of the chronic population in an average county mental hospital. Although their social-educational attainments range from unskilled labour to the professional classes, such as doctor, lawyer, medical student, clergyman, nurse, civil servant, etc., the majority (71 per cent.) were housewives, artisans, farmers, lower category clerks, and members of the working class (16 skilled workers among them). Only 27 out of 200 had reached matriculation standard or the equivalent. The overwhelming majority (81 per cent.) were educated in State-supported schools.

The average duration of stay in this hospital before operation was 4 years and 3 months, ranging from a few months up to 14 years. In all cases some form of treatment, such as suitable occupation with attempted change of environment, systematic psychotherapy for those accessible to it, both in the hospital and before admission, had been given without making the slightest difference to the clinical course of the illness or chronic invalidism. In those cases where there was no contra-indication, some form of shock treatment, such as insulin, cardiazol, or E.C.T., had been applied, but apart from transient improvement, all the cases had proved refractory or responded unfavourably to these forms of treatment.

The age incidence of the cases operated on ranged from 22 to 69 years. Sixteen patients were over 55. The average age at operation was 36 years.

Choice of patients: Indications.—The first 75 of this series were selected exclusively because of distressing and permanently disturbing hallucinations, unmanageable aggressiveness, unceasing melancholic agitation, constant unrelieved anxiety due to delusional experiences or organ sensations. Our rationale for the selection was the same as that of Freeman and Watts and other authors. We found, however, by further study and follow-ups, and by increasing experience, that it is impossible to indicate the probability of success of leucotomy, however tentatively and cautiously it is formulated, by any one symptom or pair of symptoms.

If the personality is colourful, and beneath the psychotic symptoms one can discern a depth of emotional response, this supports the indication for operation. We have found the Rorschach test a very great help in fixing the multifarious personality facets.

Clinically, the generally accepted prognostic criteria in psychiatry are also valid in leucotomy. The following should, in our experience, be regarded as favourable indications for the operation: sudden onset of the psychosis after some apparently justifiable psychological or physical eliciting cause; a marked plasticity of symptom production such as delusional productivity, a certain degree of cyclic tendency, an island of integrated personality preserved under the psychotic deluge.

Organic cerebral deterioration from arteriosclerosis or senility are definite contra-indications to leucotomy, for any damage to the brain will hasten the underlying dementing process. In the diagnosis of early cerebral arteriosclerosis masquerading, for example, as a refractory depressive illness, the examination of the retinal arteries serves a very useful purpose. This, and the palpation of the peripheral arteries, is of more diagnostic value than are
blood-pressure readings, which, in any case, are frequently normal in cerebral arteriosclerosis. An "organic" Rorschach, and discrepancies of the scores between vocabulary or verbal intelligence tests in comparison with those obtained in performance tests (Kohs' Blocks, Alexander's Pass-along tests) are corroborating evidence (Wechsler, Goldstein et al.) of an organic process, and such cases should, therefore, be excluded from leucotomy. The positive correlation of high blood urea and senile mental illness established by Richter facilitates the elimination of early senile organic states.

In psychotics who have nobody to look after them outside the hospital, or whose families during the many years of illness have lost interest and sympathy for them, or whose environmental circumstances are decidedly unfavourable emotionally or materially, leucotomy is of questionable value. If one neglects the above-mentioned factors, apparently good clinical recoveries will, in the end, be disappointing. It is, of course, a truism that leucotomy is a cerebral operation and so a major one, performed mostly under general anaesthesia, and therefore all the usual contra-indications and hazards of systemic illness, cardiac, renal, or pulmonary, have to be considered and excluded.

Time of observation after operation of cases under review: All the cases in this series were operated on more than 9 months ago; the average length of observation is 15 months, varying from 9 months to 3 years. All but 27 cases were followed up by personal interview at 2-4-monthly intervals, and were tested repeatedly for their general intelligence with different batteries of tests. Relevant information regarding the social behaviour, efficiency at work, etc., were collected from relatives, either personally or by the Social Worker, and in a few cases by correspondence.

The criteria by which the cases are classified are as follows:

Social recoveries are those in this series who are capable of independent management of their own affairs, occupy a post, have the same type of work as they had previously, or, if not the same, are earning their living or looking after their household, etc., as before the illness; at the same time, they are capable of the usual customary enjoyment of life. Insight into their previous illness is not included in the definition of social recoveries. All are discharged from hospital, and should not express or show manifest psychotic signs.

Improved are those who are more manageable, with diminished psychotic symptoms and have a better social adaptability, but are not considered well enough to live on their own and are not self-supporting. They may, or may not, be resident in hospital. They are usefully occupied, though sometimes with stereotyped tasks.

Analysis of Results.

Schizophrenic group.—As will be seen from the Table, the numerical results are rather disappointing, although individual cases may make a startling recovery, as, for example, one catatonic who, after 8 years' uninterrupted hospitalization, socially recovered. Certain features, however, seem to be worth considering. In the first place, there is the poor response to leucotomy of those with relatively meagre delusional productivity, in whom
the so-called primary symptoms of schizophrenia (Bleuler, Gruhle et al.) prevail. These are psychic anergy, remoteness and incongruity of affect, and impairment of abstract conceptual thinking. In the catatonic, hebephrenic and simplex sub-groups of our series, some of these primary symptoms were predominant in the clinical picture. It is all too well known how difficult and vague classification is in psychiatry generally and in schizophrenia in particular, but as a guide these types are useful, despite the unavoidable overlapping and telescoping of nosological groups. The three above-mentioned forms of nuclear schizophrenia were represented by 52 of the total of 92 schizophrenic cases, and only 6 of them can be regarded as social recoveries, in contrast to 13 of the 40 paranoid schizophrenics. In the latter group are included those in whom delusions of persecution, influence, etc., with a bizarre fantastic undertone, but not systematized, are the dominant symptoms. Some of the primary symptoms are present too, but not always in the foreground of the clinical picture. It seems possible that the implications of clinical experiences with regard to prognosis in both insulin and in leucotomy treatment of schizophrenics may vindicate and revive again Kraepelin's classical views of dementia praecox; in which case the nosological unity of schizophrenia would, contrary to Bleuler's views, again be split into dementia praecox and paranoid groups, regarded as separate disease entities. All our schizophrenics were hallucinated at one time or another, but hallucinations do not afford a prognostic clue to the decision to operate or not. Our observations bear out the following conclusions with regard to the advisability of operating in schizophrenics: The most unfavourable cases for leucotomy are those in whom there is an inability to form concepts of an abstract kind, coupled with the typical schizophrenic language disorder (Kasanin). An insidious onset, autistic tendencies in the pre-psychotic personal history, and absence of stormy periods of psychomotor restlessness, are of aggravating significance. Schizophrenics displaying the above summary of symptoms, with a duration of manifest illness of more than 3 years, are to be regarded, in our opinion, as only problematically suitable for prefrontal leucotomy. In hebephrenics with a "giggly" hebetude affect, and also in simplex cases with marked emotional blunting, leucotomy is, in general, contra-indicated.

In the catatonic and paranoid states, if insulin fails, leucotomy is the method of choice, and should be performed with the least possible delay before the deranged function-patterns are indelibly fixated and render any treatment hopeless. The problem of leucotomy in the schizophrenic group cannot be left without mentioning one or two points of post-operative psychological management. The success of the operation is absolutely dependent on the proper handling of this. Everything must be done to make reality and its objects attractive for the thin thread of libido which has been released by the operation from its narcissistic imprisonment. The schizophrenic personality hinges on a narcissistic grievance and the insecurity of self. The uncertainty about success or failure in life which everybody has to face in normal circumstances in coping with reality demands, assumes for the patient the quality of a deadly threat. In the post-operative psychological management of schizophrenics, everything has to be arranged for many months to come, so
Graylingwell Hospital, Chichester. Leucotomy—Analysis of the Results of the First 200 Cases. (22.X.42—9.VIII.45.)

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<th>Schizophrenic group:</th>
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Paraphrenic group:

| Paraphrenia          | 15 | 23 | 38    | 7  | 15 | 22    | 57.9| 6  | 5  | 11    | 28.9| 2  | 3  | 5     | 13.2| ...   |
| Paranoia             | 3  | 3  | 3     | 3  | 3  | 3     | 100 |    |    | ...   |    |    |    | ...   |    | ...   |
| Paraphrenic total    | 18 | 23 | 41    | 10 | 15 | 25    | 60.9| 6  | 5  | 11    | 26.8| 2  | 3  | 5     | 12.2| ...   |

Affective disorders:

| Cyclothymia          | 6  | 10 | 16    | 5  | 7  | 12    | 75  | 2  | 2  | 2     | 12.5| 1  | 1  | 2     | 6.25| 1 (F.) |
| Involutional depression | 13 | 23 | 36    | 10 | 14 | 24    | 66.7| 3  | 5  | 8     | 22.2| 1  | 1  | 2     | 2.7 | 3 (F.) |
| Affective total      | 19 | 33 | 52    | 15 | 21 | 36    | 60.2| 3  | 7  | 10    | 19.2| 1  | 1  | 2     | 3.8 | 4 (F.) |

Aggressive and oligophrenic psychopathies

| Chronic obsessional neurosis | 3  | 1  | 4     | 2  | 1  | 3     | 75  | 1  | 1  | 2     | 25  | 1  | 2  | 3     | 27.2| ...   |

Grand Total: 100 100 200 37 47 84 42 33 24 57 28 5 29 25 34 27 5 (M. 1) (F. 4)
that there is no possibility of their experiencing the alternative of failure, but only success in anything which one suggests they should do. This, of course, applies also to emotional attachment and strain, and the inevitable near-complex environment of family. As such a setting outside the hospital is rarely available, the schizophrenic patient should be treated in the hospital for as long as possible. Complicated occupational tasks should be avoided—one is frequently tempted to the contrary owing to the sometimes excellent clinical condition—for the catastrophic reaction (Goldstein) of brain failure means in schizophrenics withdrawal and narcissistic regression, with eventual complete relapse in the psychotic condition. The exposure of post-leucotomy schizophrenics to the full blast, as it were, of reality must be done gradually and expertly. Under no circumstances should they be pushed in any way.

The discussion of leucotomy effects in paraphrenia must begin with clarification of the term itself—or at any rate in what arbitrary meaning it is used here. Notwithstanding the differences of opinion of many psychiatric schools, in this report we mean by paraphrenia a chronic psychotic condition characterized by delusions of various contents which are either systematized or semi-systematized, but may be rather bizarre occasionally. A considerable part of the personality is preserved; there are no primary schizophrenic symptoms present. Hallucinations are more frequently of a pseudo-hallucinatory type, but true hallucinations do occur also and are not a rare symptom. An emotional element is often very marked; the affect is, however, congruous to the delusional content. The pre-morbid personality, to mention salient features only, is marked by an unsolved oedipus complex (only daughters or sons fixated on love-demanding parents, or intense rivalry amongst siblings, some brother or sister favoured by parents, and so on). The patients remain fixated on such childhood bonds, often never marry, or if they do, are instinctually frustrated, disillusioned. Childhood experiences and constitutional factors probably are responsible for a particularly strong bi-sexual "anlage," the suppressed homosexual part of which is often projected in the delusion formation (Freud). But the most characteristic anomaly of their personality is the tendency to project and introject, using this psychological mechanism as a defence from pressing, but conflicting, instinctual demands. The cases of paraphrenic hypochondriasis—patients who rationalize delusional organ sensations into some illness, and those with obsessional tendencies—are especially tormented in this way. The male patient presented for demonstration to-day, for example, has been called an anxiety neurotic, depressive, obsessional, mild paranoid schizophrenic, during the different phases of his Calvary. In spite of these differences, however, I am absolutely convinced that all of us here would have regarded him as incurable by psychological means alone, and after the failure of convulsion treatment, which was given because of the depressive element in the clinical picture, we should all have given up hope of ever being able to help him. In fact despite the prevailing confusion of psychiatric nosology, clinical sense and experience does enable us to estimate fairly accurately the gravity of a given mental illness. Cases showing chronic hypochondriasis with peculiar organ sensations and a tendency to project these into paranoid delusions in narcissistic premorbid personalities were,
before the advent of leucotomy, a hopeless therapeutic proposition. Whether, as Professor Pützl of Vienna thought, some sub-threshold somatic parasensations combine with specific psychological conflicts in determining the choice of symptoms, is as yet unknown. It is certainly remarkable that some patients with cancer-phobias, for example, who are miserable semi-invalids obsessed for almost a lifetime with the dread of cancer, finally die of it. I cannot go into the discussion of clairvoyance, as it were, of subconscious self-awareness, but the fact remains that disabling hypochondriacal organ-sensations, in our experience, are most amenable to treatment by leucotomy. The continuous sub-threshold discharge of sensory modalities from the periphery, sensory impulses which are absorbed and distributed via the thalamus and its cortical radiations, must have something to do with the intensity of the psychic experience of self.

The cases in this review went through all the usual treatments of innumerable bottles of medicine, previous hospitalization, psychoanalysis; and suicidal attempts or assaults on others also punctuated their sad life until they became chronics or invalids. The length of manifest illness, which varied from 3–14 years, had no significant correlation with the chances of recovery in this group. Their premorbid personality, history and endowments with regard to school, work record, social adjustment, was very much more satisfactory than in the schizophrenic group. It is amazing to see how magnificently leucotomy helped our paraphrenics. The natural caution which one has to exercise, due to the relatively short period of follow-up, is offset by the consideration that even if all relapsed, which is most improbable, the years of lucidity gained by the operation would fully justify it in any case.

Paranoia.—Two of our patients were classical paranoics in the sense of Kraepelin's description, with systematized delusions of persecution and reference; they showed pseudo-hallucinations, and were querulous and grandiose. The third displayed marked psychopathic trends in his personality and symptomatology, at the basis of which, however, there were systematized delusions of reference and annoyance.

Cyclothymics.—These were manic-depressives who had suffered from psychotic mood swings practically all their lives, but for the last few years had had to be continuously in hospital, as the intervals between the psychotic episodes had become too short, or practically non-existent. The follow-up period is still too short, and the number is too small to state any definite opinion which would be statistically significant, but one cannot help gaining the clinical impression that leucotomy possesses a curative effect for endogenous psychotic alternations of mood. If the spontaneous remissions are long lasting, however, despite the very great risks of eventual suicide in a depressive attack, leucotomy is not justified, considering the social efficiency and relative happiness of these patients without treatment. The consideration has also to be kept in mind that only the extensive form of incision (posterior cut) seems to achieve the arrest of mood swings. This causes some impairment of initiative and spontaneity and a bleaching of varying degree in the emotional sphere.

Involutional melancholia (4 agitated melancholics).—The patients of this
category were all refractory to E.C.T., or else there were strong contra-indications which prohibited the use of convulsive treatment. It is particularly gratifying to see these intensely suffering patients recover, who, if not heavily sedated, clamour for death in order to escape the intolerable mental anguish caused by their lowered vitality and state of delusional self-accusation. The desensitization of the ability for symbolic emotional experience effected by leucotomy is in these cases comparable to the relief obtained by tractotomy for some incurable neuralgic pain. One has to reckon, however, in patients over 55, with a precipitation of senescence of the personality as a concomitant effect of leucotomy, and warn the relatives of the social consequences of a happy dotage. The length of hospitalization before the operation varied from 3½ to 6 years: 7 patients were over 60 years of age at the time of operation: 2 agitated melancholics were 69 and 67 respectively.

**Aggressive oligophrenic psychopathy.**—These were, with but one exception, mental defectives whose behaviour disorder was characterized either by very frequent episodes of blind aggressiveness, threatening other patients or actually causing them grievous harm, or by destructive tantrums which made their social adjustment impossible and necessitated hospitalization. Attempted conservative remedial measure had been unsuccessful. Two were imbeciles: 8 had an I.Q. ranging from 50 to 75 (Raven's Progressive Matrices, Herring, Modified Stanford-Binet). The results are rather disappointing. In 7 some amelioration of aggressiveness was noticeable; 2, however, after 8 months and a year respectively of freedom from attacks, and after having been discharged and successfully employed, relapsed and had to be admitted to other mental hospitals. The only social recovery of this group has been a man of good general intelligence. The impulsive murderous episodes with some reactive schizophrenic colouring from which he suffered for 4 years at frequent intervals have ceased since the operation 14 months ago. To state whether leucotomy would be a suitable treatment for unmanageable aggressive psychopathies with average general intelligence needs, of course, much more experience than we have in this hospital.

**Chronic obsessional neurotics.**—Four cases, who all requested the operation on outside advice, were disabled by obsessional ceremonials, ruminations, compulsory doubts, or hypochondriacal preoccupation. Three made an excellent social recovery. All of them had had previous outside treatment by systematic psychotherapy, which had no effect on their symptoms.

**Physical and Neurological Complications of Leucotomy.**

Neurological signs which were observed in the days, weeks, and sometimes months, after the operation in about 35 per cent. of our cases were as follows: transient pyramidal signs—the first 2 days only; cortical irritability—motor restlessness and delirious confusion of the organic type, with hyperaesthesia, hyperalgnesia, patchy amnestic aphasia or perseveration—occurred in less than one-third of our total, and did not last longer than 2-4 days after the operation. In 9 patients, however, all of whom were over 50 and up to 67 years, a more chronic confusional state, also of the organic type, was seen, which lasted over 2 months. They were restless at nights and disoriented for time and person,
spatially perplexed, and inclined to mistake the strange for the familiar. These complications were more frequent when the incision was performed posteriorly, i.e. according to Freeman and Watts' instruction, 9.5 centimetres from the midline. Urinary incontinence lasting more than 2 months, the incidence of which in our series was 15 per cent., is also decidedly more frequent after the posterior operative approach; but in no case of ours did it remain as a permanent symptom—in fact it invariably disappeared within 6 months.

Eighteen patients had major epileptiform convulsions, usually 1 or 2 fits—in two cases 4–6 fits—at short intervals. All responded readily to anti-convulsive drugs administered for two months, and no recurrence of convulsions was observed later than 8 months after the operation. Fifteen of these patients had a posterior cut and 3 an anterior cut (7 centimetres from the midline).

Late neurological sequelae.—Some in the early group of 75 patients had for a time a peculiar sagging posture, lacking in tonus as it were, but this was no longer noticeable after 6 months had elapsed. Only one patient has a permanent neurological disability, which he gradually developed after the operation. It is a choreiform jerking of the limbs and involuntary grimacing, rather similar to that seen in Huntington's chorea. He is a paranoid schizophrenic, unchanged mentally by the operation performed more than 2 years ago. His mother died of some form of chorea.

A slight flabbiness of the innervation of the facial muscles—rendering the play of expression less distinct than before—is in a few cases a lasting sequel. Bulimia is a relatively frequent post-leucotomy symptom in our patients, but it also disappears within 6–12 months. The ravenous appetite may also be responsible for some unusually rapid gains in weight. Some of our female patients showed hirsutic changes; this was seen in 7 cases: 4 of them had previously had a pronounced facial growth of hair, but after leucotomy they developed a veritable beard which needs trimming. Nothing definite emerged about their menstrual cycle; some patients did report amenorrhoea following the operation.

Intelligence.—The impairment of simultaneous grasp, and of discriminative conceptual thinking, which we observed by psychometric testing, and from reports from the patients themselves, also a tendency to perseveration, was not noticeable after the follow-up 10 months later. In fact, apart from the age-group over 55, we could not detect any impairment of cognition or any intellectual deficit after 1 year had elapsed. We tested 96 cases with the Herring, Modified Stanford-Binet, Raven's Matrices, Kohs' Blocks, and Pass-along tests, but could not find any significant difference in their general intelligence, except that in the recovered cases the scores show less scatter due to less preoccupation with the psychotic experiences. Patients over 55 show a discrepancy of their vocabulary, verbal and performance scores—in some consisting of a difference of 15 points to the disadvantage of performance (10 out of 16 patients). We tested these cases also with Rorschach's blots, but we could not surmount the difficulty of familiarity with the blots when shown before and after operation, so we found it impossible to utilize these in our findings with regard to post-operative personality changes.

Mental state after operation entirely depends on the type of illness, and on
the previous personality—and to some extent, probably, on which and how many fibres have been cut. The days immediately following operation were by many dominated by disinhibition phenomena of frontal brain damage. If hostile and remote before, as in schizophrenics, the negativistic attitude changed over into hypomaniacal familiarity, into a “hobnobbing” chit-chat with crude, facile jocularity, and so one was able to contact the patient for the first time, perhaps, for many years. The stilted language, neologisms, the spheric type of associations (Kleist’s intrapsychic ataxia) was in the background for some hours only, to return a few days later, unfortunately. Some patients become irritable and rude in this first phase of frontal hypomania, and one is surprised to hear obscenities blared out by a self-belittling, unworthy, retarded depressive. This frontal release phase does not, however, last longer than a few days; in a majority of patients it does not appear at all; only in about 40 per cent. of the cases is it present. The attitude of the majority is only friendly, but sparing with words and punctuating many sentences with an obliging “Thank you very much.” This over-politeness disappears very gradually; in most cases there remains a trace of it after a year or more. In whatever mental or organic state the patient may be in the first 6 months after operation, it has, according to our observations, no prognostic significance for the final result of the original mental illness. It was most dramatic to hear, for instance, a patient operated on under local anaesthesia (6 have been done so) to say, after the last lower cut had been performed, “The megaphones are quiet; I do not hear them any more; how peaceful it is now,” meaning, of course, the auditory hallucinations which she thought came from small megaphones put behind her ears by some malicious plotters. Unfortunately the hallucinations returned 20 days later, and she remains hallucinated, although perhaps with less intensity.

The process of recovery in the successful cases, to whatever clinical group they belong, is gradual. Delusions once established have an inertia, so to speak, and it takes many months, if not years, until they fade. True auditory hallucinations in the few successfully treated schizophrenics persist as long as delusions; the patient in the meantime expresses his disinterestedness in them, and in his behaviour loses the characteristic schizophrenic fascination for the voices. The emotional incongruity which prevails in such a sinister way in the schizophrenic scene changes to a somewhat flat affect.

In affective disorders the process of re-integration is very much quicker; paraphrenics with well-preserved personality first successfully dissimulate, and after 6 months or so genuinely report spontaneously that the delusional ideas or hypochondriacal organ sensations do not cause them to be preoccupied any more. None of the patients regained true insight in the full sense of the word, or is really able to appreciate what the operation was for, or its importance. There is a tendency to displace their interest, when asked about the operation, on to the hair, scar, etc., and although they sometimes reproduce, “gramophone-like,” that they had a brain operation, it is without emotional emphasis. The most intelligent patients are utterly unable to ascribe any significance to the operation, apart from stereotyped phrases about it, heard or read, which they repeat faithfully, but as if it had not happened to them.
The direct effects of the operation on psychic life are those on the personality. The specific change which was verified in the surveyed cases was a poverty or entire lack of dreams, and a thinning, or disappearance of dereistic experience—they cannot daydream about their wishes, or be abstractly angry in a sustained fashion. They become, owing to this emotional asymbolia, more plain, matter-of-fact like. In many ways this has a resemblance to slight senile personality changes. Owing to the emotional desensitization the passions and conflicts which are expressed in their psychosis gradually shift out of focus, very much as old men can look serenely upon the follies of their youth. Again, as in senile personality changes, post-leucotomy patients do not like adventure, but want to remain in a more or less stereotyped routine of activities. The learning ability for new knowledge is, as some patients complain, reduced. In the old involutional melancholic the paradox occurs that the desperate loneliness of oncoming senility is alleviated by reaching sooner the state of a happy dotage. This is borne out, not only in the personality changes, but in the neurological symptoms too; for example, if they had a tremor of the hands, it gets worse after leucotomy; their gait, also, becomes less steady.

The fundamental personality pattern remains unchanged after leucotomy; it has less legend only. The emotional short-circuiting in a previously colourful personality certainly is preferable to an incurable psychotic misery. We had no patient in this series who was worse after the operation. Three of the improved cases after more than a year still manifest frontal disinhibition and are unrestrained, selfish family tyrants; whether this is due to more extensively damaged frontal areas owing to anomalous placing of the cut, or to some secondary changes, is impossible to say. The topographical variability of the incision, decisively proved by Alfred Meyer, is with the present technique unavoidable, and a grave drawback. In our series there was no clinical disadvantage accruing from the more anterior incision, but certainly much less aspontaneity and loss of initiative.

**Mortality.**—We lost 5 patients whose death was directly attributable to leucotomy: 4 died of cerebral haemorrhage, 1 of staphylococcal meningitis. The percentage is 2.5. Three died of intercurrent illness more than a year after the operation.

**Relapses.**—Two paraphrenics classified as recovered relapsed, both a year after the operation, one as a result of harassing environmental circumstances. One schizophrenic classified as "improved" relapsed after 3 months; an improved aggressive psychopath relapsed 8 months after operation.

Before I finish this report, I have to thank most sincerely Dr. Carse, the Medical Superintendent, without whose co-operation, advice and help in every way I could not have collected these observations. My thanks are also due to my colleague and the nursing staff who, despite the difficulties of war years, never lost their admirable enthusiasm and interest for our work.