PERSONALITY CHANGES AFTER ROSTRAL LEUCOTOMY: A COMPARISON WITH STANDARD PREFRONTAL LEUCOTOMY

By

JOHN PIPPARD, M.D., M.R.C.P., D.P.M.

Consultant Psychiatrist
Claybury Hospital, Woodford Bridge, Essex

"STANDARD" leucotomy in the plane of the coronal suture is undoubtedly an effective treatment for many cases of otherwise hopeless prognosis. The main objection to its use, resulting in many "modified" operations being devised, has been the occurrence of serious personality deficits afterwards. Ström-Olsen and Tow (1949) found that these handicapped nearly three-quarters of patients with "severe neurotic depression, obsessive-compulsive neurosis and chronic tense hypochondriasis", and though 76 per cent. were relieved of illness only 8 per cent. were in full employment. Tow (1952) has repeated his concern at the serious damage inflicted on well-preserved personalities. Partridge (1950), who has given a full account of the personality changes after McKissock's (1943) "standard" leucotomy, detected some personality deficit in nearly every case of the 300 he investigated and suspected that intellectual impairment was present in all, though he could only be sure of it in a proportion. I have elsewhere (Pippard, 1955) reported the clinical results in 240 cases followed up 1½ to 5 years after rostral leucotomy by Mr. McKissock and this paper should be consulted for details of the operative techniques and scales used for rating the results.

As recently as 1952 the writer of an annotation in the *Lancet* could say, of operations confined to the ventro-medial quadrants, "the cured patient is likely to be emotionally blunted and may become friendless".

It must be said at once that so far as rostral leucotomy is concerned this is unduly pessimistic, for it will be seen that in 95 per cent. of cases the personality changes are negligible. It seems worthwhile attempting a comparison with Partridge's series, of the effects of this operation on the personality; this will bring out the difference clearly.

Partridge considered in detail 60 patients who had recovered from affective disorders, since in these the changes directly due to leucotomy should be less obscured by persistence of changes due to illness. I shall consider the changes in 114 patients, selected, from those I followed up, by excluding any with schizophrenic or paranoid states, complicating organic nervous disease, dementia or known operative haemorrhage; those whose rostral operation was not their first; those still, or again, in hospital; those not personally interviewed or about whom, for some reason, there is insufficient information. In considering certain subjective changes I shall include 6 other patients also. Of the 114 cases, 21 had had Open rostral O operations, 70 Blind rostral B and 23 Blind rostral G.

Symptomatically, 21 had become free (rating S1), 53 were much improved (S2), 31 were improved (S3), and 4 were unchanged (S4). The result was good in 66, fair in 22 and poor in 26 cases.

Following Partridge's plan it is convenient to consider the changes under the headings of (1) activity, (2) affect, (3) restraint, (4) intellect.

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

(1) ACTIVITY

Thirty-nine of 114 patients still showed, at follow up, a post-operative reduction in energy or drive noticeable to their friends or to themselves which was referred to in such terms as "less drive"; "not enthusiastic"; "less of a go-getter"; "likes to take things easy"; "things are more of an effort for him"; "tire more easily".

A wife remarked, "He will sit now and read, or just sit; before, if you could get him to sit for 5 minutes it was a miracle. He doesn't want to go out; if there is no work to do all he wants is to go to bed. Sometimes I could scream." Another said that her husband needed more prodding. Eight patients spend more time in bed and a few take an unwonted nap, but none have had difficulty in getting up in the morning (a tendency to get up late persisted in 22 of Partridge's 60 cases at 2 years). The older patients were inclined, sometimes perhaps correctly, to attribute these slight changes to the passage of the years.

Five patients were slower at their work, and achieved less in the time, e.g. a middle aged housewife would still be doing chores at tea time which formerly were out of the way by lunch. Apart from reduction in energy, an intellectual deficit making it impossible to plan work as efficiently (particularly in 2 cases), partly accounted for their slowness.

Seven patients, in contrast to these, manifested an increase in activity and drive after operation, presumably because hampering symptoms had been relieved.

Lack of spontaneity was not a marked feature of these patients, in contrast to its comparative frequency after standard leucotomy; some patients may have been less spontaneous, but it was not enough for relatives to remark upon, and at interview was rarely found; one woman tended to be monosyllabic and another volunteered little except on questioning, but these patients are exceptional. It is exceptional, too, to find lack of persistence, the drifting from one job to another not more important, that was still noticeable in 28 of Partridge's 60 patients after 2 years; but of one man his wife said, "he never finishes a job: we haven't a clock or watch in the house that goes because he has them all in bits; before his operation I had only to ask for a thing for it to be done at once".

Reading: Questions about reading habits reveal deficits in the fields of activity, affect and intellect in about one-quarter of the cases. Many others, of course, have never been readers. No patient was disorientated and most showed a knowledge of current affairs (even if only of the activities of 'Jane' and 'Garth') consistent with their intelligence and education. Five patients certainly showed less interest in the news and three, though claiming to read several newspapers each day, showed remarkably poor grasp of affairs.

Questions about leisure occupations and reading were frequently met by apologies for not doing more, or by vague statements which on closer examination revealed a change in habits, e.g. an obsessional clerk professed an interest in the newspapers and books ("everything came back to normal within a few days of the operation") but in fact he rarely reads anything now but the *Reader's Digest* ("what with magazines and papers; you see you have lots of writing, and I get tired in the evenings; it is often more restful to sit and listen in; perhaps in the past I wouldn't have listened in so much"); others, too, are more ready to take their entertainment from Radio and Television but it is impossible to be sure that this is more marked in these patients than in the general population. Some find less interest in reading, or lack the drive to get books from libraries, finding it easier to skim through magazines which are

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

ready to hand; thus a man of 36 who read a good many detective stories before operation, now only reads when he casually picks up a thriller his mother has borrowed from the library: unless he finishes it at a sitting he doesn't bother to read to the end.

Nine patients found less time to sit and read, the commonest excuse put forward for not reading, but 2 patients relieved of their symptoms to a considerable extent, now read more, and 2 others have been able to relax and read for the first time in their lives. By contrast, a woman who would only relax with a book or her knitting now just relaxes.

(2) Affect

Deficits in this sphere were evident in 47 of the 114 patients, including 25 of those who also showed reduction in activity, and 4 of those who showed an increase. The most frequently noted changes were a tendency to be less concerned for others, more selfish, with diminished regard for appearances and the opinion of others (24 cases). Patients remarked of themselves, "I'm less sympathetic, harder", or "I'm an unfeeling little beast; when the child used to cry I would cry too, but now I will give her one . . ." Several patients had been unmoved by the death of loved relatives; the sister of one 66 year old who had been chronically depressed was deeply distressed at the patient's cheerful whistling round the house whilst her brother lay dying, and at her lack of concern when he died, "You would almost think she didn't feel things." The mother of a 34 year old obsessional postman said of his reaction to his father's death "he came through it wonderful; if he *was* upset he didn't let us know". A 65 year old hypochondriac, almost symptom-free, showed no distress when her only son emigrated a year after operation.

A young compulsive neurotic said, "I don't care what people think of me now", but resented it when her landlord "put upon" her. A deeply religious Scotswoman whose involutional melancholia had lasted 9 years said, "I can see now that people don't mean to hurt." One woman was described as "shrewder, drives a harder bargain".

Many patients obviously worried less, and this was referred to specifically in about a third of cases. "Nothing worries her now, she's always cheerful" was an observation repeated in various forms by many; 3 patients were euphoric, but only 1 of these was a little fatuous and giggly. Conscience obviously sat more lightly on several, e.g. 2 obsessional men who were more ready to take a few days off work for their own purposes than they had been in the past; one earnest young man summed himself up by saying, "sincerity has given way to expediency". Two other men are more ready to skimp things: the postman does not bother so much if he cannot deliver a letter! A few patients gave an impression of, and were themselves conscious of, a loss of affective depth; 2 hysterical psychopaths both regretted the felt loss of capacity for great joy, the price they paid for a reduction in the downswings of despair, and one found that Tchaikowsky's music had lost its power to move her, though she could still appreciate the more primitive rhythm of Ravel's "Bolero", and was more interested in dance rhythms generally than she had been. An anxious obsessional also lost some of his capacity for musical pleasure. By contrast, another obsessional patient became appreciative of music only after his successful leucotomy, but much of his appreciation is that felt by one craftsman for another and seems to be in good measure intellectual.

A tendency to be less concerned with past events, implicit in the present contentment of many, was made explicit in 2 cases: "I can talk about the past

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

without any feeling", said one, and another talked of harrowing experiences without the slightest distress, and her daughter said that she had become less "shockable". A lessened concern for the future was also evident in several patients; 3 were not as careful with money: a husband said, "she used to be careful, preparing for the future; now it seems to be spending for the day", but in only one case was a carefree frittering away of money on his personal comfort and pleasure a source of real anxiety to his wife.

A number of examples have been quoted to show the sort of changes which have taken place but it must be emphasized that though about one-third of the patients show a noticeable reduction in activity and energy at follow up, and about one-half have recognizable affective deficits, yet in comparatively few is there anything to upset either patient or relatives.

Tearfulness: crying was, of course, a frequent expression of misery in these patients and it was only to be expected that with the relief of depression and anxiety there would be much less.

This was so, but what was unexpected was a complaint made by a patient early in my investigations that she could no longer cry even when she wanted to. Further questioning revealed 9 patients who had found themselves unable to cry since leucotomy and 8 of them regretted it (there were of course many others who don't cry but feel no desire to); "If you get upset about something, having a cry lets it out. Yes, I try to cry but it doesn't come, and I used to be very tearful." Only 2 related the loss to being "harder" or to feeling that things no longer affected them; the others definitely missed having a "safety valve" to release pent up feelings.

Two other patients noticed an increase in involuntary tearfulness; a man who finds himself weeping at the cinema much more readily, and the Scotswoman already mentioned who finds that tears only come in association with laughter, which itself comes perhaps too readily.

Freeman and Watts (1942, p. 290) quote, in a letter from a patient, "several years ago I could weep and relax when things piled up too high for me emotionally. I'm not able to weep any more and I take my spells out in talking too much."

The "visceromotor apraxia" evident here suggests that part of the relief of anxiety and tension by leucotomy may be due to a reduction of the somatic manifestations of emotions, perhaps by a direct interference with fronto-hypothalamic pathways. A relief of somatic anxiety was the only noticeable effect of leucotomy in one routine-bound obsessional whose symptoms had maternal approval.

(3) Restraint

Personality changes under this heading were noted at follow up in 52 of 114 patients. The change most commonly mentioned by relatives and very often by the patients was increased irritability, a tendency to flare up more quickly though almost always the anger was short lived and afterwards they bore no grudge, sometimes a welcome change. This "touchiness" was shown by 26 patients. It had certainly been present earlier in several who were no longer touchy and probably others had forgotten about it. By contrast, 11 patients were reported better in temper. One of these and 12 of the more irritable patients were less restrained in speech with an increased tendency to speak what was in their minds; another 20 patients were more outspoken but without any apparent change in temper.

In 5 patients only did the outspokenness amount to anything like tactless-

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

ness. Tactlessness involves, in addition to lack of restraint, a reduction in empathy and in the capacity to appreciate intellectually what the situation requires; when one man, after standard leucotomy, held a long conversation with his sister-in-law about the recent death of her child, it seemed that his tactlessness arose not only because he was less restrained but because he could no longer imaginatively enter into her experience, and saw the situation only as one calling for conversation. His wife said of another, "he has lost his kindliness in pointing out things gently". One woman, never on good terms with her husband, spoke her opinion of him openly in the street where previously she had confined her confidences to her teaparties. For the most part outspokenness was unimportant and in several cases was welcomed, husbands approving of the way their wives could give as good as they got in verbal exchanges with neighbours or tradespeople. It was sometimes a nuisance though, as when a butcher was antagonized, at a time when meat was scarce, by expressed doubts about his honesty as a tradesman.

A young woman, aggressive and impulsive anyway, went to a Labour Party meeting during the General Election some months after her rostral leucotomy. The chairman introduced the candidate for re-election with the words "I am sure you will all agree with me that we have never had a better M.P. than ——", whereupon the patient said in a loud voice, "What about Winston Churchill" and had to be removed shrieking from the meeting when the staunch supporters of the candidate turned on her. This outspokenness surprised her husband and the neighbours but was negligible by comparison with the lack of restraint she showed later, after standard leucotomy, when, clad only in her nightdress, she chased her young son round the garden shrieking murderous threats at him.

No relative of any rostral leucotomy patient had any reason, like the husband of a patient after her second, standard, leucotomy, to be on tenterhooks whenever they went out socially for fear of what innocent but tactless remark might next fall from her lips.

Diminished restraint was evident in other ways in a few patients; one woman, rendered less sensitive and more superficial, was less reserved and got more fun from her life. Three patients were noticeably more demonstrative of affection to their spouses. Only one patient did anything to bring her into conflict with the police, but was not prosecuted: she stole a few spoons as an act of petty revenge; this was in keeping with her immature, hysterical personality, but she had not previously acted in this way; her impulsive second marriage soon after operation may also be regarded as in part due to lack of restraint, as well as in part to a lack of judgment.

In considering the importance or otherwise of the changes in personality noted, we must never lose sight of the personality setting, nor of the circumstances which call forth the manifestations. As Partridge demonstrated, the changes are not always present but may be regarded as tendencies concealed or revealed according to the demands of the situation. Thus, after 7 years in hospital, a man came home to his wife who had a life of her own; with her he was rudely outspoken and critical, and within 3 months she left him. With everyone else, and at his work which he does well, he behaves normally and shows no lack of restraint.

(4) Intellectual Changes

Fifty-eight of the 114 patients were considered to show evidence of impaired function intellectually. In addition I shall consider 6 other

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

patients who were excluded because there was nobody to give information about other personality changes, but who themselves supply the necessary information about their intellectual functioning: 3 are impaired.

Patients usually mentioned difficulties spontaneously; if they did not do so it was unusual to elicit them by questioning. There were 2 main types:

(i) memory difficulties;

(ii) difficulties with conceptual thinking.

(i) *Memory Difficulties*

(a) *A forgetting of whole sequences of past experience*, always in a patchy sort of way: 16 cases. In some the memory could be recovered by a suitable reminder, e.g. a patient had forgotten the withdrawal of the B.E.F. from Dunkirk until reminded of it by reading Churchill's *War Memoirs*, but another could not recall Dunkirk even when reminded, and in other cases too the episodes seemed permanently lost.

In the group of 120 patients 64 had had more than 6 E.C.T. in the past and 13 of these (20 per cent.) reported "lacunar" memory deficits. Fifty-six had had less than 6 E.C.T. and only 3 of these (5 per cent.) had deficits.

(b) *Difficulties with retention and recall:* 38 cases. In contrast to the lacunar memory defects which always involved pre-operative experiences, these are present troubles. I have excluded a few patients who complained of memory troubles before as well as after operation.

As examples, many patients find themselves more absent minded; they put things down and lose them (5 cases), they forget things whilst shopping which they had intended to bring in (4 cases), they find it necessary to make lists, memoranda, etc. (3 cases). One said he could not sustain thought and had to jot down at once what occurred to him, and another said "I don't remember things I'm told even when I'm interested and have taken them in". Two young women, resuming nursing, found themselves much slower at learning than they had been, with difficulty in taking things in and a need to repeat things to themselves over and over again. One woman was slow in learning a new job because she forgot what she was told, though she recognized it when told again.

Many patients found it more difficult to recall names or to fit names to well known faces, and one overcame this by deliberately associating something else with whatever name he wanted to remember, e.g. Brown with Paper. It seemed that there was an exaggeration in these people of the well known phenomenon of "having something on the tip of one's tongue", and often the required name or information would pop into the mind later, sometimes much later, showing that it was somewhere all the time but not available; a wife said, "he will forget things you have told him within the hour and then perhaps remember it a day or two later"; a photographer who had had, as he said, a "photographic memory", could no longer connect people's faces with photographs of them he had taken in the past; a husband said, "she has an excellent memory if things are recalled to her but she cannot recall them spontaneously as easily as she used to do". The woman who could not recall Dunkirk said, "I can remember things as you talk about them but I can't go back on them and call them to mind . . . if I am going to make a pie I don't know how to start, and to be truthful I guess it and it always comes out all right." Examples such as these could be multiplied but enough have been given to indicate the sort of associative memory difficulty observed in 5/21 O, 24/73 B and 11/26 G cases; though a source of minor irritation to the patient, it rarely seems of practical importance.

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

(ii) *Disturbances of Conceptual Thinking*

Disturbances of conceptual thinking were noticed in 26 of 120 patients; 12 of them had difficulties with retention and recall also.

(*a*) Loss of ability to plan work was found by 6 patients; a skilled dressmaker found herself making elementary mistakes such as cutting out a centre-back to a selvedge, and gave up this work to become an invoice clerk; a painter finds that having finished painting a room he may have omitted to paint a large patch on one wall; a previously efficient housewife was less able to plan a meal for more than the usual number and tended to overstock the larder. Inability to carry through a job to completion, as in the case of the man who had all the clocks in pieces, may show a lessened capacity to plan; certainly at his work as a builder he is much less efficient than he once was. There seemed to be a similar intellectually determined inefficiency about their housework in 2 others.

(*b*) A lessened capacity to deal with more than one thing at a time; 5 cases, including 3 of those just considered; the dressmaker, for example, found it necessary, where it had not been so before, to give undivided attention to boiling milk or making toast. If she tried both together, the milk boiled over and the toast burned.

(*c*) Four patients experienced greater difficulty in comprehending what they read or heard. An accountant could not understand what he read in technical books at a standard he could previously tackle.

(*d*) Three patients complained they could not do crossword puzzles so well, but this is too complex an intellectual exercise to analyse in detail; associative memory impairment may be one of the factors involved.

(*e*) Eight patients seemed to have a difficulty in calculating not present before. Since a minority of patients had been adequately tested in this respect before operation objective evidence is lacking but 2 patients could reverse only 5 instead of 7 digits at follow up and the latter, a business man, could not work out discount correctly. An hotel book-keeper, long accustomed to such exercises before operation, had found herself, to her surprise, unable to work out 2½ per cent. of £2,000 and when given pencil and paper showed no idea of even the first principles. One young psychopath showed an interesting failure initially in taking 7 from 100, despite a willingness to co-operate, but did the serial subtraction correctly in 55 seconds once he had grasped it: "100—7? equals 103 wouldn't it? No, Christ no, 113. No, 199, 198, no it *can't* be 190 something . . . 7 from 10 is 3; it can't be 113. It's 90 something, 93!" (triumphantly).

It is important to note that such difficulties are unusual. I made a habit of asking patients to repeat digits forwards and in reverse, to take 7 serially from 100 and to attempt simple arithmetical calculations, whether such tests had been recorded before operation or not. These cases are the only ones in the total 120 where the performance differed significantly from any previously recorded or from what might reasonably have been expected from a person of that intelligence and education. Partridge found that 26 of 35 patients showed a reduced ability to reverse digits.

(*f*) Five patients referred in such general terms to their intellectual deficits as "mind slower", "less intelligent", "less alert".

(*g*) Several found a difficulty in concentrating which had not been present before operation. This is a complex function and was disturbed for different reasons; 2 patients could not maintain a train of thought, and in one this was clearly related to his difficulty in retention; perhaps it is a similar disturbance of function which makes concentration effortful instead of automatic for another

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

and which makes reading a book too much of a strain for an elderly woman. In these cases one has the impression that their capacity for sustained attention is reduced, a deficit which may underlie intellectual difficulties classified under other headings, e.g. difficulty in comprehension. Certainly in one case, and probably in others as well, the affective factor of lack of interest seemed more important than a specifically intellectual deficit in determining lack of concentration.

(*h*) One 35 year old schoolteacher blamed the leucotomy for complete loss of visual imagery similar to that discussed in 2 cases by Brain (1954). Other intellectual impairment was evident in her inability to give an ordered history and in a marked impairment of associative memory; she could reverse only 4 digits. Geographical remoteness made further investigation of her case impossible, but 14 months after operation she had had a severe attack of status epilepticus and though there was no evidence at the time of any operative complication this obviously cannot be excluded; in this case, as in Brain's, there is not enough evidence to allow localization of the responsible lesion.

Difficulties in conceptual thinking were observed in 0/21 O patients, 18/71 B patients and 8/26 G patients. It is possible that in the longer follow-up period of the O cases deficits present at an earlier stage may have diminished but my impression is that the deficit is more marked in the G cases than in the rest, in 3 of whom there are grounds for believing that the operation was unduly extended by operative haemorrhage. It is more likely that the greater damage of the more posterior G incision is the real explanation of the difference.

Discussion of the Intellectual Deficits

Many patients blamed the leucotomy for their intellectual deficits and one was unusually definite: "E.C.T. affected my memory so that I could not believe I had had it, but if people speak to me I often have to ask them their names . . . that is how the operation has affected me." Several patients asserted that their memory disturbances dated from E.C.T. given before operation. It is generally accepted that the memory disturbances caused by E.C.T. vary with the amount given and usually disappear within a few weeks or months (Lowinger *et al.*, 1946). Zubin (1948) found that recall and relearning show complete loss after shock but that recognition is hardly touched, and learning and retention return to at least as good as before within about 3 weeks. Michael (1954), using Rylander's noun enumeration test, found a significant decrease in scores after 5 E.C.T. with return to normal within a week of stopping treatment. Janis (1950) describes a patchy amnesia after E.C.T. and guardedly concludes that there is "some kind of interference with the normal production of habitual verbal associations", such as I have recorded in these patients; he mentions some memory losses persisting for more than a year. Sargant and Slater (1954, p. 96) state that a "slight degree of impairment, in most cases temporary, does exist in the majority of patients shortly after the conclusion of a course of treatment . . . in exceptional cases it may persist for very long periods or indefinitely"; they comment on the inadvisability of giving prolonged courses of E.C.T. because of the effect on memory.

It is one thing to suspect that the impairment of memory complained of after leucotomy may be partly due to electroplexy, even though patients themselves may attribute it to the operation; it is quite another matter to demonstrate it convincingly. For example 25 of the 37 patients (68 per cent.) with difficulties of retention and recall had had more than 6 E.C.T. before leucotomy, and 9 of them more than 24 E.C.T. Of 54 patients with no detected intellectual deficits

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

of any sort 22 (41 per cent.) had had more than 6 E.C.T. and only 1 more than 24 E.C.T. Statistical analysis of the figures is not justified since the group with no detected intellectual deficits is not a true control group; it may be that the experience of E.C.T. amnesia in the past predisposes to awareness of memory disturbances after leucotomy, so that on these grounds alone the group reporting memory disturbance must be regarded as suspect, since it is largely self-selected. The fact that the two groups do not differ from each other in any striking way, e.g. diagnostic categories, level of intelligence, does not overcome the objection; if one excludes the O cases, who had comparatively fewer E.C.T., a less extensive operation and a longer follow up period, and the G cases, who had more E.C.T., more extensive operation and shorter follow up period, leaving only the B cases, which form a more homogenous group, we find that 3 of 21 with less than 6 E.C.T. have deficits in retention and recall compared with 16 of 31 with more than 6 E.C.T. Though the difference is heightened the groups are still not properly comparable.

The type of memory disturbance under consideration, an impairment of association, is well recognized after more extensive operations and it is of interest that 5 of 8 G patients who had less than 6 E.C.T. show such a deficit and 6 of 9 who had more than 6 E.C.T.

Though nothing is proved I am left with a clinical impression that E.C.T. given before leucotomy may increase the amount of memory impairment noticed after leucotomy, though anything attributable to electroplexy may be swamped with a more extensive cut than B.

Conceptual thinking difficulties are of a type not seen after electroplexy and are reported in this series independently of the amount of E.C.T., but, as already mentioned, tend to be more severe after G than after the other operations.

Whatever the basis for the increased reports of memory disturbance by leucotomized patients who have had much E.C.T. there are clinical grounds for repeating Sargant and Slater's warning, quoted above, against giving long courses of E.C.T. In 2 cases given 76 and 152 treatments the severe memory impairment might have been avoided by earlier operation, which successfully relieved symptoms in both.

(5) Work Adjustment

There is a dearth of professional occupations in this series (the only professional man, a chemist, had been keeping house for years whilst his wife went out to work); there is no indication amongst these cases that the type of occupation makes any difference to the work adjustment after leucotomy.

As might be expected, those who are relieved of their symptoms achieve a better work adjustment than those who are not. Table I shows the relationship between work ratings and ratings for symptom relief.

Forty-five of the 114 patients were working as well as ever in their lives, and 32 more at a very satisfactory level considering the degree of incapacity they had suffered through illness. The work adjustment can thus be regarded as good in two-thirds of these cases.

Only those call for special comment who despite considerable symptom relief fail to achieve a good work adjustment, the 9 cases shown in the right upper quadrant of Table I. In 4 cases the personality deficits, though not severe, were such as to make these never very sound personalities less effective than the symptomatic relief might lead one to expect. One lost her job as a waitress because she was too abrupt with the customers, and another lived in a constant

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

TABLE I

	W.1 (Up to best previous level or better)	W.2 (Much improved but less skilled or lighter than best previous)	W.3 (Working but efficiency still impaired)	W.4 (No change)	W.5 (Worse)
S.1	12	6	3	0	0
S.2	28	19	5	1	0
S.3	5	7	4	14	1
S.4	0	0	0	9	0

i.e. of 21 rated S.1. 18 (86 per cent.) rate W.1 or 2.
of 53 rated S.2. 47 (89 per cent.) rate W.1 or 2.
of 31 rated S.3. 12 (39 per cent.) rate W.1 or 2.
of 9 rated S.4. 0 (0 per cent.) rate W.1 or 2.

stew because of her worsening relationship with her brother, to which her increased shrewishness contributed. She and another patient showed an increased distractibility which made them less efficient housewives.

In 4 cases life circumstances had altered so that much less was expected of them; a lonely widow had nobody to encourage her to be more effective, and little incentive. Their daughters had taken over most of the work from 2 cases, to the ineffectiveness of one of whom a rather fatuous euphoria contributed. She was an elderly hypertensive and is thought to have suffered more damage than intended. The retirement of one man from even a nominal connection with work was in part hysterically motivated.

There is insufficient evidence to show whether rostral leucotomy does or does not produce such personality deficits as might interfere with highly skilled and responsible work; however a business man who had to live by his wits was hampered by impairment of associative memory and of ability to do mental arithmetic, as well as by the diminished drive and slightly lessened sense of responsibility and impaired business acumen which persisted after a phase of post-operative hypomania had subsided.

No patient could be called a creative worker, but there were several skilled craftsmen (notably 2 toolmakers and a cabinet maker) who retained their skills.

(6) RELIGION

Despite special enquiries the results are meagre. The great majority of patients have never given more than lip service to religion, and few even as much as that. Those who were churchgoers before operation usually continued afterwards though some were more lax. One goes "more when I feel like it" than she did and another is "not *quite* so regular".

Apart from external observances an R.C. convert has found religion even more important and "more real" since operation; along with this goes an acceptance of the unfulfilment of her ambitions, and finding "the Great Unknown less towering".

A depersonalized obsessional is "less concerned about the ultimate things".

Another obsessional has found a deepening of his personal religion as a result of freedom from neurotic fears and yet another finds her prayers clear now, undisturbed by obsessive thinking.

A middle aged spinster, disgruntled as always, maintains her trust in the future life because the present is so unsatisfactory and resents that others are slack in attending church.

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

One of the skilled craftsmen still enjoys phantasies of being a very religious person.

The Scotswoman, already quoted, expressed the view that her illness had its place in the Divine purpose for her. "I feel I have been reborn into a new world and can see that all the experience of those 8 years is very important to me . . ." Her faith has been deepened as a result and she feels that it is securely hers now and not merely her father's.

An Anglican clergyman found no change in his devotional life.

The only conclusion one can draw is the very general one that the religious attitude is not directly affected by rostral leucotomy but is liable to be affected in the reintegration of the personality after operation, as indeed it may be in the reintegration after psychotherapy or any other treatment. This agrees generally with the experience of Sargant and Slater (1954, p. 269) after modified operations.

(7) Sexual Adjustment

There were minimal changes in the sexual adjustment of these patients. Where loss of interest was symptomatic, e.g. of a depressive illness, recovery from illness was usually accompanied by a return of sexual interest. Where frigidity was symptomatic of a personality disorder it was rarely affected, though one hysteric seemed a little less frigid and two obsessional women permitted sexual intercourse where previously they had refused their husbands because of obsessive guilt. Another allowed more frequent intercourse and derived occasional pleasure but "my husband knows what is good for him and has never worried me". One young woman has married happily and had a baby since leucotomy.

An obsessional man found that sexual intercourse left him physically exhausted for only 24 instead of 48 hours! A young psychopathic rag and bone man became actively homosexual for the first time 2 months after leucotomy but he had been associating with homosexuals for a long time and it was probably a question of when? rather than whether? One man, otherwise unchanged by operation, was impotent for 3 months and has since suffered from premature ejaculation; it is likely that this is psychogenic.

Summing up, there is little change in sexual adjustment except in so far as lessening of restraint and freedom from anxious guilt permits more freedom in intercourse.

(8)

Table II

Compares the Ratings for Symptomatic Relief (S) with the Ratings for Personality Deficits (P) After Rostral Leucotomy

	P.1 (On balance resulting in improvement)	P.2 (None, or indefinite)	P.3 (Slight)	P.4 (Marked)	Total
S.1	6	3	10	2	21
S.2	6	12	30	5	53
S.3	1	14	14	2	31
S.4	0	7	2	0	9
Total	13	36	56	9	114

i.e. with symptom improvement rated 1 there is some personality change in 18/21 (86 per cent.)
with symptom improvement rated 2 there is some personality change in 41/63 (77 per cent.)
with symptom improvement rated 3 there is some personality change in 17/31 (55 per cent.)
with symptom improvement rated 4 there is some personality change in 2/9 (22 per cent.)
($\chi^2 = 13 \cdot 10$, n=2, p=$< \cdot 01$)

6 of 18 (33 per cent.) rated S.1 were regarded as changed for the better and 6 of 41 (15 per cent.) rated S.2. and 1 of 17 (6 per cent.) rated S.3.

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

This suggests that, when symptoms are relieved, personality deficits may be acceptable and regarded as good which in a setting of continued illness might have proved irksome; for example, outspokenness in a happy person may be an attractive trait but not in a disgruntled and miserable one.

Frankl and Mayer-Gross (1947) considered that symptomatic relief depended on producing a counteracting degree of frontal lobe deficit symptoms. Meyer and Beck (1954) related symptom relief to an "adequate" cut (which would incidentally bring about more personality changes than an "inadequate" one).

The figures for the rostral series at least indicate that symptomatic improvement and personality changes are related, and it seems likely that both are dependent upon the extent of the cut.

The rating P.4 was given to only 9 of the 114 patients and it is useful to enquire why there should have been this degree of personality change, common enough in patients after standard leucotomy. The explanation which suggests itself is that post-operative bleeding may have increased the amount of damage to something like that deliberately produced by standard leucotomy. In favour of this is that 4 of these patients are amongst the 13 in the series of 114 who were incontinent during the first few weeks after leucotomy; one of these was doubly incontinent and he and another patient also showed more inertia and confusion than is usual after rostral leucotomy. Two of the 13 incontinent patients were only incontinent once, one had been incontinent before operation, and one, who was rated P.1, showed marked personality changes which would have justified rating P.4 had they not been desirable.

Thus 4 of 10 patients with marked personality changes were amongst those 10 in the total 114 who are suspected on other grounds as well of having had a more extensive lesion than usual. These figures support the hypothesis. In 2 other cases epilepsy since operation may well be related to the personality changes.

(9) Personality Changes in Cases Later Submitted to Standard Leucotomy

Thirteen cases, including 3 who had unilateral operations, satisfy the criteria laid down for selecting rostral patients for consideration of personality changes; in the one unilateral case symptomatically much improved the decreased restraint and diminished sensitivity make her a more satisfactory personality than before. There was some evidence of intellectual deficit, notably a difficulty in spelling not present before, which she says is because she can either see the word in her mind's eye or try to spell it but not both simultaneously. She can, however, write the word down correctly, and it is only a few words which have caught her out in this way. She constructs her sentences inaccurately at times, e.g. "When you get it up I will straighten it down" instead of "When you get up (from your chair) I will straighten it". Two dullards in the rostral series and one other complained of a similar spelling difficulty. Another unilateral case was not helped by the standard leucotomy, and an intellectual difficulty appeared which was not present before: she found herself unable to deal with propositions in the form Either . . . Or . . . The enunciation of the second alternative erased from her mind the memory of the first and she could not compare the two in order to reach a decision. No rostral patient had an intellectual difficulty quite like this.

The third unilateral case also noticed intellectual difficulties after the standard operation, particularly that his "powers of recall have been inter-

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

fered with" (comparable with many patients in the rostral series) and also that he no longer just knows what day it is but has to work it out by deliberate "piecing of it together".

Of the 10 patients who had a bilateral standard leucotomy 1 is rated P.2 (an involutional melancholic who seemed unaltered by either of her operations); 2 are rated P.3; 6 are rated P.4; 1 is rated P.5.

The personality changes in the 7 patients rated P.4 or 5 are more severe than in any patient in the rostral series. In one they do indeed amount to virtual destruction of the personality and Dr. Partridge tells me that this is the worst result of leucotomy in his experience. Another case, excluded because she was in a mental hospital at follow up, is very similar.

(10)

In order to compare the effects of leucotomy on the personality it is convenient to arrange the cases in groups more or less corresponding to Partridge's (Table III); from this it is at once evident that the changes after rostral leucotomy are usually of little consequence, being negligible in all but about 5 per cent. of cases symptomatically much improved, compared with 56 per cent. of cases after standard leucotomy.

TABLE III

Comparison of Personality Changes after Rostral and Standard Leucotomy

	Partridge (1950) (59 cases) Per cent.	Rostral (*a*) All (114 cases) Per cent.	Rostral (*b*) S.1 & 2 (74 cases) Per cent.	Standard after Rostral
1. Virtually no personality change or changes so slight as to make no significant difference	16 (27)	50 (44)	28 (38)	1
2. Slight changes present but making no important difference in their lives	10 (17)	56 (49)	42 (57)	1
3. More marked changes so that families are constantly aware ..	12 (20)	3 (2·5)	2 (2·5)	3
4. Patients difficult to live with but less so than ever before	4 (7)	3 (2·5)	2 (2·5)	–
5. Positively undesirable changes ..	17 (29)	2 (2)	—	5

N.B.—This table was prepared independently from Table II since Partridge's categories are not quite equivalent to the personality ratings I have used.

The figures for the rostral series are given in 2 columns (*a*) the whole group of 114 patients; (*b*) those with symptoms much improved, or symptom free (and therefore more comparable with Partridge's).

SUMMARY

The effect of rostral leucotomy on personality in a selected group of 120 non-psychotic patients followed up at home 1½ to 5 years after operation is described and compared with the effect of standard leucotomy in Partridge's (1950) series.

One-third of patients still showed a noticeable reduction in "drive", but a few had been more active since operation than they had ever been. Few patients showed much reduction in spontaneity, but there was a tendency for leisure pursuits to be less active.

Nearly half the patients had detectable affective deficit; particularly, they tended to be less concerned for others, more selfish, less sympathetic. They worried less and were more contented. However, the changes were rarely more than slight and in comparatively few was there anything to distress either patient or relatives.

Nearly half the patients were less restrained; this showed chiefly in speech and temper; tactlessness was exceptional and never a problem, indeed the freedom of speech was often welcomed by relatives. The quickly flaring but rapidly subsiding temper was readily accepted by families, who often preferred it to the sulks and grudge-bearing of the past.

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press

Half the patients had some intellectual impairment, but rarely of more than academic interest. Patchy amnesias and defective retention and recall were frequent and have been noticed more by patients who in the past had more than 6 E.C.T. Disturbances of conceptual thinking, present in about a quarter of cases, seem to have no relation to E.C.T., but are a little more marked in G cases than in B, and were not observed in O cases.

There were no active professional people in the series and therefore there is no evidence about the effect of rostral leucotomy in highly skilled and responsible workers. The work adjustment after operation ran closely parallel to the symptomatic relief; it was unusual for any lowering in status at work to be due to the effects of leucotomy. Sixty-seven per cent. of patients were in full employment or keeping house as efficiently as before illness.

Religious attitudes are not directly affected by rostral leucotomy.

There is little change in sexual adjustment except as a result of relief of illness.

Ratings for personality changes are significantly correlated with ratings for symptomatic relief. Both are considered to be related to the extent of the leucotomy lesion.

Personality deficits were more marked in 10 patients (9 per cent.). There is some evidence that where changes are marked the operative lesion has been more extensive than it should be, either because it was misplaced or because of post-operative haemorrhage or venous thrombosis; in 2 cases the marked personality changes may be related to post-operative epilepsy.

All but one of 13 other patients who later had unilateral or bilateral standard leucotomy suffered an increased personality deficit and in 7 cases the losses were more severe than in any case in the rostral series.

Personality deficits are negligible after 95 per cent. of rostral leucotomies which have given good symptomatic relief, compared with only 44 per cent. of standard leucotomies. Positively undesirable changes were present in only 2 of 114 cases, compared with 29 per cent. of standard leucotomies.

References

BRAIN, R., *Proc. R. Soc. Med.*, 1954, **47**, 288–290.

FRANKL, L., and MAYER-GROSS, W., *Lancet*, 1947, *ii*, 820–824.

FREEMAN, W., and WATTS, J. W., *Psychosurgery. Intelligence, emotion and social behavior following prefrontal lobotomy for mental disorders*, 1942. Springfield.

JANIS, I. L., *J. nerv. ment. Dis.*, 1950, **111**, 359–382.

Lancet, 1952, i, 407.

LOWINGER, L., and HUDDLESON, J. H., *Amer. J. Psychiat.*, 1946, **102**, 594–598.

MCKISSOCK, W., *J. Ment. Sci.*, 1943, **89**, 194.

MEYER, A., and BECK, E., *Prefrontal leucotomy and related operations: anatomical aspects of success and failure*, 1954. Edinburgh.

MICHAEL, S. T., *Arch. Neurol. Psychiat., Chicago*, 1954, **71**, 362–366.

PARTRIDGE, M., *Prefrontal leucotomy. A survey of 300 cases personally followed over 1½ to 3 years*, 1950. Oxford.

PIPPARD, J. S., *J. Ment. Sci.*, 1955, **101**, 756.

SARGANT, W., and SLATER, E., *An introduction to physical methods of treatment in psychiatry*, 1954. Edinburgh.

STRÖM-OLSEN, R., and TOW, P. M., *Lancet*, 1949, *i*, 87–90.

TOW, P. M., *Lancet*, 1952, *ii*, 253–255.

ZUBIN, J., *J. Person.*, 1948, **17**, 33–41.

https://doi.org/10.1192/bjp.101.425.774 Published online by Cambridge University Press