

AN EVALUATION OF PREFRONTAL LEUCOTOMY IN THE AFFECTIVE DISORDERS OF OLD AGE: A FOLLOW-UP STUDY

By

F. T. THORPE, M.R.C.S., L.R.C.P., D.P.M.

*Medical Superintendent
Middlewood Hospital, Sheffield*

THE senile emotional disorders are now a major problem in mental hospital practice and their incidence increases with age. It is fortunate, however, that a better understanding and recognition of these affective disorders has, in most cases, led to early treatment and recovery.

A detailed study of the various mental disorders of the senescence has shown that functional disorder is more common than had previously been suspected, and it is probable that one half of patients over 60 years of age admitted to a mental hospital have a recoverable melancholic state, the remainder consisting mostly of the more serious organic psychoses (Roth, 1952). Many of the emotional breakdowns occur for the first time in old age, and their rapid onset with a depressive mood serves to distinguish them from senile cerebral degeneration with its gradual intellectual impairment. There is little overlap between these two conditions although the differential diagnosis may be difficult when apathy is the dominating feature of the case.

In doubtful cases of functional disorder, the diagnosis can often be settled by giving three or four applications of electroplexy as a therapeutic test which does little harm in organic cases. Indeed, the beneficial effects of E.C.T. in senile melancholia have long been established. A discharge rate of 75 per cent. can be obtained (Ehrenberg *et al.*, 1955), but as many as 37 per cent. may relapse, and although further E.C.T. is of benefit, a modified lower quadrant prefrontal leucotomy will produce a more lasting recovery.

Prefrontal leucotomy is indicated in the recurrent or relapsing case of senile melancholia, or when E.C.T. fails or is contra-indicated on physical grounds. Such patients are faced with the prospect of indefinite confinement to the mental hospital, possibly for life, and there is a heavy toll in death from exhaustion, pneumonia and other intercurrent infections (Roth, 1952).

The value of any new treatment is best seen in the long-term follow-up, yet only a few reports of leucotomy in the aged have appeared, and this is a field which has still to be explored (Sargant and Slater, 1954). We therefore decided to review the outcome of the first 50 patients over the age of 65 submitted to leucotomy at Middlewood Hospital during the period 1947 to 1952.

A recent follow-up has been made on the 50 cases and a report obtained for every patient. A questionnaire was sent to the next of kin of patients discharged, and nine of these were followed up by personal interview. By these means an assessment has been made of both the early and the late results of the operation, the latter giving the present condition of 32 patients still living five to nine years after leucotomy.

The results of these assessments are shown in the tables under three grades of post-operative improvement. A full remission or recovery (+ +) indicates

an absence of anxiety, tension or depression, or any of the symptoms shown before operation, a return to the former level of social adaptability and an absence of any post-leucotomy personality defects or mental deterioration. A partial remission (+) implies that some improvement or mitigation of the emotional disorder has occurred, tension and depression lightened, with social improvement and less dependence on others. In some of these cases a mild degree of apathy together with reduced initiative persisted. The third category of no remission (0) means a return to the pre-operative level of psychiatric disability with little or no amelioration of symptoms. In no case apart from one death from post-operative haemorrhage could it be said that the patient was made worse or demented.

CASE MATERIAL

The selection of cases was determined by the severity of the symptoms, and the failure of E.C.T. to produce sufficient or a lasting improvement or when E.C.T. seemed inadvisable. In recent years the use of muscle relaxants has increased the safety of E.C.T., and extended its use in old people.

In 39 cases the clinical picture was that of agitated melancholia with restlessness, lamentations, suicidal trends, refusal of food and delusions of self-depreciation. In 7 cases there was apathy and mental retardation. There were 2 cases of senile paranoid psychosis and 2 cases of senile mania. Active suicidal tendencies were present in 17 cases.

None of the patients gave a history of progressive intellectual or memory loss. The duration of psychiatric illness varied from a few months in recurrent cases to several years in others, with no significant difference in outcome from operation. Case No. 6 for example, was in hospital for 7½ years despite E.C.T. and was discharged after operation.

There were 6 men and 44 women in the group, their ages ranging from 65 to 74, with a mean age of 68. There was no association of age and recovery, and in three patients aged 74, two were discharged home. The number of patients with previous admissions to hospital was 25, and 15 of these had had attacks prior to the age of 60 years. There was no appreciable difference in the results of cases with early and late onset.

Acute and chronic physical illness is known to be common in the emotional disorders of old age (Roth *et al.*, 1956), and in this series care was taken to exclude any serious organic disease, but a moderate degree of hypertension in the absence of cerebral symptoms was accepted. The diastolic blood-pressure was over 100 mm. Hg in 13 cases, yet 9 were discharged home, and one died within two years of operation.

In all cases the psychiatric prognosis had been regarded as poor, and in 25 patients the response to E.C.T. was disappointing. In the other 25 cases E.C.T. was not given for varying reasons, mostly because of hypertension or tendencies to relapse. The operation results were similar in both groups.

OPERATIVE PROCEDURES

A standard prefrontal leucotomy (Freeman and Watts, 1944) was carried out in 6 cases (Nos. 1, 3, 4, 15, 42, 43) and in 42 cases the incision was restricted to the lower quadrants in the anterior plane of the prefrontal areas of the brain as described in a previous report (Thorpe and Hardman, 1952). In the last two cases (No. 49 and 50) an electrocoagulation of the ventromedial quadrants was performed according to the technique of Grantham (1951). All the operations

were performed by Mr. James Hardman in the Neurosurgical Department of the United Sheffield Hospitals. In every case a general anaesthetic was avoided.

Post-operative complications were few, but one patient (No. 16) died from cerebral haemorrhage on the 10th day and another (No. 42) developed an infection of the operation site which was successfully treated by an antibiotic. Post-operative epilepsy occurred in four cases and persisted in two (No. 2 and 15) though not to any serious degree.

EARLY RESULTS (UP TO 6 MONTHS)

The immediate results of the operation were excellent and are summarized in Table I. Only two patients failed to show a significant improvement—a

TABLE I
Early Results in Diagnostic Categories

Diagnosis	No. of Cases	Remission of Symptoms			Status at 6 Months		
		(++) Full	(+) Partial	(0) Nil	Dis-charged	Died	Still in Hospital
Agitated depression	39	30	8	1	26	1	12
Retarded depression	7	4	3	—	5	—	2
Mania	2	1	1	—	1	—	1
Paranoid	2	—	1	1	1	—	1
Total	50	35	13	2	33	1	16

paranoid patient and the one who died from operation. In all the other patients there was a noticeable relief of anxiety and tension, often seen by a ready smile a few hours after the operation. Agitated patients became quiet and relaxed, making no mention of their previous worries and lamentations. Mental confusion was rarely seen, though a transitory phase of "denial of operation" occurred in a few cases.

Patients are encouraged to return home as soon as possible and most of the 33 discharges left hospital within 2 months of the operation. A good remission of symptoms occurred in 35 cases (Table I) and a partial remission in 13, but for social reasons not all of these patients could leave hospital. The agitated depressive patients did well, and of the 7 with retarded depression (Nos. 5, 6, 27, 32, 40, 44, 46) five were discharged. The results in the 2 manic (Nos. 15 and 43) and the 2 paranoid patients (Nos. 4 and 48) were as follows. One manic patient made a partial recovery but could not be discharged, and the other was discharged with a good remission, though re-admitted later. There was no improvement in paranoid Case 48, a deaf old lady with persecutory delusions, and a partial recovery occurred in paranoid Case 41, who became resigned to his hypochondriacal symptoms and was discharged home.

LATE RESULTS

At the present survey 5 to 9 years after operation, 32 patients still survive, and a total of 35 (70 per cent.) have lived for over 5 years. There are 18 patients at home, 14 in hospital and 18 have died (Tables III, IV, V). A full recovery has been maintained in 21 cases, a partial recovery in 10, and 1 case is unchanged (Table II).

TABLE II
Results of Present Survey 5 to 9 Years After Leucotomy

Diagnosis	No. of Cases	Remission of Symptoms			Present Status		
		(++) Full	(+) Partial	(0) Nil	Discharged	Died	Still in Hospital
Agitated depression	39	18	8	—	16	13	10
Retarded depression	7	2	1	—	1	4	2
Mania	2	1	—	—	—	1	1
Paranoid	2	—	1	1	1	—	1
Total	50	21	10	1	18	18	14

Relapses

A total of 7 patients were re-admitted after discharge from hospital, 4 with a history of recurrent attacks. In addition, Case 46 died from a suicidal attempt after being admitted to a general hospital. Of the 7 re-admissions, 4 were subsequently discharged again, one after a second leucotomy operation (Case 4) and of the 3 relapsed patients still in hospital, 2 have regained a good remission again. Only 4 patients (Nos. 4, 25, 32, 46) could be said to have had a genuine relapse, Case 4 having relapsed completely. The other 4 patients were re-admitted for minor symptoms. The period between discharge and relapse in these patients ranged from 6 months to 4½ years.

Recurrent Depressions

Of the 25 patients who had two or more attacks of depression prior to operation, 2 had a genuine relapse after operation (Nos. 4 and 32) and were discharged again, and the remainder kept well. Case 26, for example, had previous admissions in 1931, 1940, 1942, 1948 and 1949 (2) and has now remained well at home for 7 years. Case 29 had admissions in 1939, 1942, 1947, 1948 and 1949 and has also been home for 7 years. Case 42 with 5 admissions has been home for 6 years, and Case 32 also with 5 admissions lived at home for 2 years. These cases support the claim that leucotomy prevents the recurrence of depressions.

Deaths

At the present time a total of 18 patients have died (Table III), and

TABLE III
Patients Deceased

Case No.	Age at Operation	Date of Operation	Blood Pressure	Early Results	Discharge	Re-admitted	Late Results	Died	Survival Years to Death	Cause of Death
2	66	Nov. 1947	165/85	+	No		+	Feb. 1950	2½	Cardiovascular
3	69	Jan. 1948	150/80	++	Yes		++	Sept. 1955	7½	Cardiovascular
4	74	Jan. 1948	200/100	++	Yes	Yes	++	Dec. 1952	4	Cardiovascular
5	67	Aug. 1948	145/100	++	Yes		++	April 1949	½	Pneumonia
6	66	Aug. 1948	130/80	+	Yes		+	May 1952	3½	Cardiovascular
7	65	Aug. 1948	200/110	++	No		+	Mch. 1951	2½	Cardiovascular
10	65	Nov. 1948	160/90	++	Yes		++	Oct. 1952	4	Cardiovascular
12	68	Feb. 1949	200/90	++	Yes		++	April 1956	7	Pneumonia
14	72	May 1949	180/100	+	No		+	Mch. 1950	½	Pneumonia*
15	68	May 1949	140/90	+	No		+	Feb. 1954	4½	Cardiovascular*
16	73	June 1949	190/90	0	No		0	June 1949	10 days	Haemorrhage*
18	67	Aug. 1949	200/100	++	Yes		++	July 1955	6	Cardiovascular
20	72	Sept. 1949	210/115	++	Yes		++	Jan. 1953	3½	Cardiovascular
21	74	Sept. 1949	170/110	++	Yes		++	Aug. 1951	2	Cardiovascular
31	66	Dec. 1949	130/70	++	Yes		++	Jan. 1953	3	Cardiovascular
32	70	Dec. 1949	200/110	++	Yes	Yes	+	Sept. 1951	1½	Cardiovascular
33	68	Dec. 1949	150/80	++	Yes		+	April 1953	3½	Cardiovascular
46	65	Nov. 1951	150/90	+	Yes		+	Feb. 1956	4½	Suicide*

* Autopsy.

excluding the post-operative death, the survival period ranged from 6 months to 7 years, the causes of death being unrelated to the operation. Death occurred at home in 8 cases; in the mental hospital, 5; and in general hospitals, 5. The causes of death were cardiovascular, 13; pneumonia, 3; suicide, 1; cerebral haemorrhage, 1; and were determined by autopsy in four cases, and the rest by reports from relatives.

The observations of relatives of patients who died after discharge from hospital are full of praise for the results of the operation, and it was apparent that in many cases the patient was enabled to live the remainder of life with serenity of mind. Replies to enquiries have been couched in such terms as "better in his nerves than he had been for a long time" (Case 5), "pleased with the results of the operation" (Case 4), "results entirely satisfactory" (Case 12), "the operation made a wonderful difference" (Case 20), "more alert" (Case 3), "mentally well up to the time of death" (Case 10).

Patients Still in Hospital

There are 14 patients still in hospital 5 to 8 years after operation although only one failed to improve (Table IV). Of the 7 patients with an early remission, 5 have remained well and could be discharged home or to hostel accommodation. The 8 partial remissions have some residual emotional defects, and four

TABLE IV
Patients Still in Hospital

Case No.	Age at Operation	Date of Operation	Blood Pressure	Early Results	Re-admitted	Late Results	Survival Years to Date
9 ..	67	November 1948	190/100	++		++	8
11 ..	66	November 1948	170/100	+		+	8
13 ..	66	May 1949	120/70	++	Yes	+	7
17 ..	66	July 1949	190/80	+		+	7
34 ..	65	February 1950	140/75	++	Yes	++	7
35 ..	68	March 1950	210/120	++		++	7
37 ..	65	July 1950	220/140	++		+	6
38 ..	66	July 1950	160/90	+		+	6
39 ..	68	August 1950	150/90	+		+	6
40 ..	66	August 1950	160/100	+		+	6
43 ..	66	December 1950	180/100	++	Yes	++	6
44 ..	69	May 1951	150/90	++		++	5
48 ..	72	March 1952	170/80	0		0	5
49 ..	74	March 1952	220/120	+		+	5

of them still need psychiatric care mainly because of apathy and lack of initiative (Cases 13, 17, 39 and 49). Case 48 with paranoid symptoms remains unchanged.

Patients Still at Home

There are 18 patients living at home 5 to 9 years after operation (Table V), 16 maintaining a full remission although 2 had to return to hospital during a short relapse of depressive symptoms. In Case 1, there was a history of 3 years depression and head noises, but she has now been at home for 9 years and is 80 years old. The head noises are still present but she is no longer depressed by them.

Sample reports from these patients and their relatives leave no doubt of the value of the operation, e.g. "a miracle", Case 19; "the operation has been a great success, she has been quite normal since returning home", Case 50;

“operation has been very successful”, Case 45; “she is wonderful”, Case 30; “completely successful, with gratitude and sincere thanks”, Case 47.

TABLE V
Patients Still at Home

Case No.	Age at Operation	Date of Operation	Blood Pressure	Early Results	Re-admitted	Late Results	Survival Years to Date
1 ..	71	November 1947	170/100	++		+	9
8 ..	67	August 1948	160/90	++		++	7
19 ..	65	August 1948	170/100	++		++	7
22 ..	67	September 1949	200/100	++		++	7
23 ..	65	September 1949	170/110	++		++	7
24 ..	68	October 1949	160/90	++		++	7
25 ..	71	November 1949	170/100	++	Yes	++	7
26 ..	66	November 1949	210/115	++		++	7
27 ..	65	November 1949	190/110	++		++	7
28 ..	69	November 1949	180/115	++		++	7
29 ..	67	November 1949	190/90	++		++	7
30 ..	66	December 1949	160/90	++		++	7
36 ..	66	May 1950	170/100	++	Yes	++	6
41 ..	66	October 1950	170/90	+		+	6
42 ..	66	December 1950	150/90	+		++	6
45 ..	65	June 1951	220/110	++		++	5
47 ..	65	January 1952	150/90	++		++	5
50 ..	67	April 1952	190/120	++		++	5

Post-leucotomy Personality Defects

In this group of 50 elderly patients, post-operative personality defects have been absent. Such undesirable behaviour trends as inconsiderateness, irritability, volubility and emotional facility, reported after the more extensive operations, are less likely to occur following an anterior lower quadrant incision. No case developed a dementia, or the “loud laugh that speaks of the vacant mind”. In Case 13, there was a short phase of obscene mutterings, and Case 42 went through a period of truculent mania. Most of our patients had good pre-psychotic personalities albeit characterized by over-conscientiousness and guilt-proneness which, while predisposing them to melancholic reactions, protected them from any excessive disinhibitory effects of leucotomy.

COMMENT

It is pertinent to consider what would have happened to these 50 patients if they had not had leucotomy. They were all considered to have a poor prognosis, either in relation to the current attack of mental illness, or the probability of relapse. Many had failed to benefit from E.C.T., and it is doubtful if any lasting benefit would have been obtained by the use of tranquillizing drugs.

It is likely that without operation their expectation of life was reduced, though the survival-rate in the senile depressive is higher than that in the organic dementias. Roth and Morrissey (1952) found that in a group of 81 patients over 60 years of age admitted to a mental hospital with emotional disorders, 23 per cent. were dead in 2 years. In another similar group of 56 cases admitted to an observation ward, Post (1951), reports 27 per cent. died in 3½ years. It is not possible, however, to compare these findings with our group of cases which were not only over 65 years of age, but were selected by exclusion of serious physical illness, and many had been in hospital for lengthy periods.

It has been reported in several papers that the most favourable results from leucotomy are to be found in the older patients, and our study confirms this.

The Board of Control (1947) in a survey of 1,000 leucotomy patients of all ages reports that 17 of the 36 patients over 65 (47·2 per cent.) were discharged and remained at home. Scoville (1955) reports the results of orbital undercutting in 20 patients over 65 years of age, with significant improvement in all, and discharge in 17 (88 per cent.).

The comparative rarity of relapses following leucotomy in the older age group was observed by Gillies (1952) and in our long-term follow-up only 4 cases (8 per cent.) had a genuine relapse. One of these was severe but recovered after a second operation, and no case had more than one relapse. Since 5 of the re-admissions had a history of recurrent attacks, it must be concluded that leucotomy reduces but may not entirely abolish the tendency to recurrence.

In our earlier paper (Thorpe and Hardman, 1952) we reported a discharge rate of 67 per cent. of patients aged over 60 (25 of 43 cases) and some of these form part of the 66 per cent. discharges in the present survey. At the time of writing there are 18 patients still at home 5 to 9 years after operation, and if we add to these the 13 patients still in hospital though improved, a total of 31 patients (62 per cent.) have so far maintained improvement for at least 5 years.

In the selection of cases suitable for leucotomy, one would expect the best results when organic cerebral disease is minimal, and the clinical history, psychiatric findings and physical examination give a clear picture of functional disorder. Cases with marked arteriosclerosis, a blood urea of over 50 mg. per cent. or a cerebrospinal fluid protein of over 60 mg. per cent. require careful assessment before undertaking a leucotomy. It is to be anticipated that cerebral arteriosclerosis will increase the risk of post-operative haemorrhage, but a moderate degree of hypertension is quite compatible with a good post-operative recovery.

None of our 13 cases with diastolic blood pressures of over 100 mm. Hg. developed a senile dotage, and most of them made a good recovery, though there was no evidence of any lasting change in the blood pressure readings. It has been reported, however (Lenstock and Groen, 1953), that leucotomy was beneficial in a case of malignant hypertension with psychogenic symptoms.

Post-operative epilepsy is an accepted though not serious risk, and is usually readily controlled by anticonvulsants. Of our 4 cases, 2 developed an early fit 4 and 11 days after operation (Cases 12 and 30) and both made a full recovery with no further fits. The other two cases (Cases 2 and 15) however, developed late fits 5 and 11 months after operation, and here the results were poor, thus confirming the observations of Stengel (1950) and Meyer and Beck (1954) that these cases usually do badly. An autopsy on Case 15 revealed that the full leucotomy incision had involved the cerebral cortex to a considerable degree—a feature found by Meyer and Beck (1954) to predominate in the epileptic leucotomized patients.

The rarity of undesirable post-leucotomy personality defects in the elderly patient is confirmed in this study, and the only after-effect observed was the occasional occurrence of apathy, lassitude and diminished initiative. Our results confirm the opinion of Scoville (1955) that there is little risk of mental deterioration arising after a limited or modified leucotomy operation in the non-organic mental disorders of the aged, and that it is the treatment of choice whenever the patient fails to respond to one course of E.C.T.

The lasting benefit from intolerable anxiety and depression speaks for itself, and will be seen in the follow-up reports from patients and their relatives. The incidence of relapses will be small, and most patients will be able to enjoy their remaining years at home.

SUMMARY

A long-term follow-up has been made on the results of a limited leucotomy in a series of 50 elderly patients over 65 years of age admitted to a mental hospital with emotional disorder, and an assessment made 5 to 9 years after operation. The clinical diagnoses were agitated depression 39; retarded depression 7; paranoid state 2; mania 2. Recurrent attacks occurred in 25 cases prior to operation.

All patients except two showed appreciable improvement following the operation, 35 with complete and 13 with partial remission of symptoms. Discharges number 33. There was one death from post-operative haemorrhage, and 4 patients developed post-operative epilepsy.

At the present assessment, 32 patients are still alive, 18 at home and 14 still in hospital. Of these, 21 (16 at home) are fully recovered, 10 (2 at home) partially recovered and one unchanged. Within a period of eight years 18 patients have died—16 from natural causes. Only 4 patients relapsed after returning home.

It is concluded that a lower quadrant leucotomy is an effective treatment for intractable or recurrent senile melancholic states. At least two-thirds will recover completely and survive for at least five years without relapse. There is little danger of post-operative mental deterioration, and most patients will be enabled to live the remainder of their lives with added years of equanimity.

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