

Further Experience of Limbic Leucotomy

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ABSTRACT

The data of 100 patients who had undergone stereotactic limbic leucotomy are analysed. All of them were suffering from severe intractable psychiatric illness. The authors' conclusions are the following. (1) Limbic leucotomy produced a 67% overall improvement rate. (2) One third of the patients, however, received no appreciable benefit from surgery. (3) The results in obsessional neurosis are particularly good, while those of depression left something to be desired. (4) The detailed method of assessment reported here enables different types of lesion placement to be compared. (5) Stereotactic methods allow for much smaller lesions to be placed with a high degree of accuracy, hence the risk of mortality is reduced to zero. (6) Much valuable work can be done to refine methods of patient selection, surgical technique and psychiatric and psychological assessment.

INTRODUCTION

At the fourth World Congress of Psychiatric Surgery in 1975 the results of the first 66 consecutive patients to undergo stereotactic limbic leucotomy were reported.¹ The data of the first 100 patients, followed up for a mean interval of 20 months, are now being analysed and this is a preliminary communication of the ongoing assessment of limbic leucotomy.

THE PATIENTS

Thirty-two males and 68 females in the series had a mean age of 38 years (range 19-74 years) and were all suffering from severe intractable psychiatric illness. They had failed to respond to, or to maintain impro-

vement from, alternative forms of treatment; their mean duration of illness was 12 years, and they had spent on average nearly two years in psychiatric hospitals. Forty-four percent of the patients had made one or more suicidal attempts prior to surgery. If there was any doubt about the adequacy of previous treatment, they were admitted to the inpatient psychiatric unit of St. George's Hospital and re-treated before surgery was seriously considered. The Consultant Behaviour Therapist on the academic staff of the unit independently reviews and treats all the patients with obsessional neurosis, or other conditions which may respond to behaviour therapy, before surgery is contemplated.

The following criteria are used in assessing the patients' suitability for psychosurgery :

1. The severity of illness, which in most cases results in total incapacity and/or an intolerable life.
2. The chronicity of the condition.
3. Failure to respond to other appropriate forms of treatment : such as ECT 90%, Psychotherapy 70%, or Modified Narcosis 50%.
4. Absence of contraindications such as psychopathy, alcoholism or drug addiction, uncontrollable violence or intracerebral pathology.
5. The patient's full agreement to the operation. Only patients who are NOT compulsorily detained in hospital under the Mental Health Act are deemed eligible.

THE OPERATION

The stereotactic technique used by Dr. Richardson has replaced the rostral leucotomy of Sir Wylie McKissock. Limbic leucotomy is designed to interrupt frontothalamic and hypothalamic connections in the lower medial quadrant of the frontal lobe, and the main limbic circuit, the Papez circuit in the cingulate area(2) (Fig. 1).

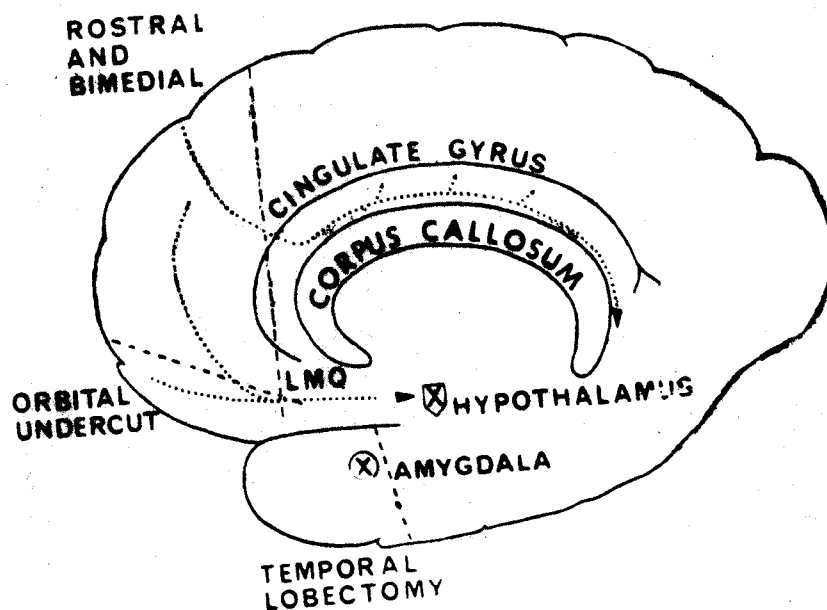


Fig. 1: Frontolimbic pathways and sites of some free-hand psychosurgical procedures. In stereotactic tractotomy lesions are made in the posterior 2 cm of the orbital undercutting incision, and in stereotactic limbic leucotomy small lesions are made in the lower medial quadrant (LMQ) of the frontal lobe and in the cingulum bundle (dotted) in the cingulate gyrus. The amygdala (A) and hypothalamus (H) are target sites for operations on the defence reaction circuit for uncontrollable violence associated with epilepsy. (Reproduced with permission of Br. J. Hosp. Med.).

Both bony and ventricular landmarks are used for calculating the target sites (indicated by a dot in a circle; Figs. 2 and 3), and electrical stimulation of these invariably results in physiological changes, especially in respiration. If adequate responses are not obtained the target may be moved a few millimeters prior to lesion-making by thermo-coagulation or with a cryogenic probe.



Fig. 2: Lateral X-ray of the skull showing air in the ventricles and the stereotaxic frame in place. The lower medial quadrant target sites (1, 2 and 3) and cingulate sites (4 and 5) are shown. (Reproduced with permission of Postgrad. Med. J.)

The majority of patients had three small lesions in each frontal lobe and four in the cingulum bundle as shown in Figs. 2 and 3. Some patients had frontal lobe lesions with others in the genu of the corpus callosum instead of the cingulum, following Laitinen's report at the Second World Congress where he advocated such placement for reducing chronic anxiety.

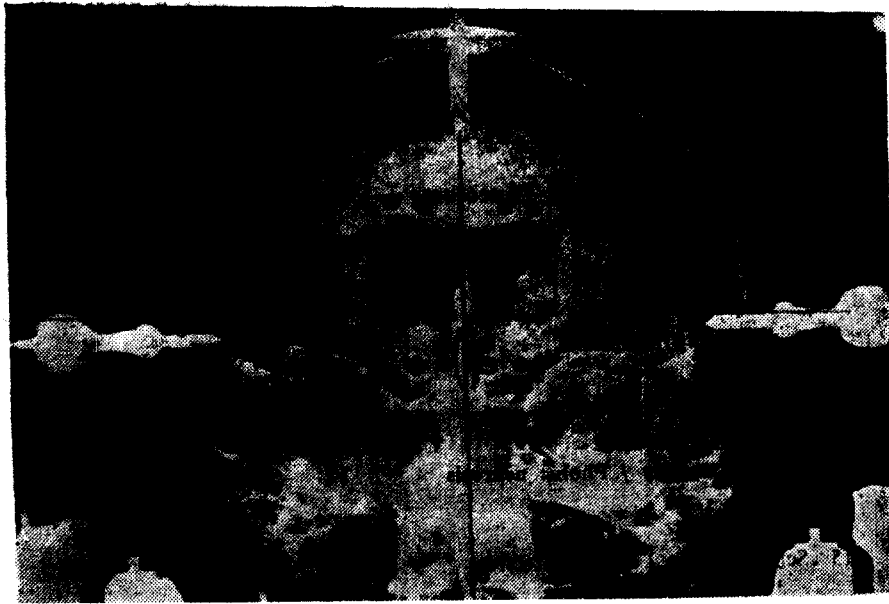


Fig. 3: Antero-posterior view of the skull with air in the lateral ventricles. The 3 lower medial quadrant target sites form a triangle, while the cingulate sites are above the roof of the lateral ventricles. (Reproduced with permission of Postgrad. Med. J.).

FOLLOW-UP

The patients were reviewed with rating-scales after a mean interval of 20 months post-operatively. Since the forms used were not scored until some weeks later, the results were not known at the time of the two

independent psychiatric assessments by Dr. Mitchell-Heggs and Dr. Kelly. The less favourable of their two clinical ratings is used; I Symptom free; II Much improved (minimal residual symptoms); III Improved (definite improvement, but significant residual symptoms); IV Not improved; V. Worse: i.e. the clinical state is less satisfactory than pre-operatively, although not necessarily because of the operation, but because of continuing illness leading to further deterioration.

Categories I, II and III are placed together to give a percentage of overall improvement.

TABLE I

Stereotactic Limbic Leucotomy — Improvement Ratings at Follow-Up (N = 100)

N	Diagnosis	Clinical I, II, III	ratings IV, V.	% Improved
32	Obsessional neurosis	28	4	88
21	Chronic anxiety / Phobic neurosis	12	9	57
18				
+1	Depression	11	7+1	61
15	Schizophrenia / Schizo-affective disorder	11	4	73
3	Anorexia nervosa	1	2	
1	Personality disorder with anxiety	1	—	
4	Personality disorder with depression	2	2	
1	Depersonalization with depression	—	1	
1	Dementia with depression	—	1	
1	Intractable pain with depression	1	—	
1	Paranoid state with depression	—	1	
1	Palilalia with Parkinsonism	—	1	
100		67	32+1	67

Of the total sample, 32 patients were suffering from obsessional neurosis of whom 88% improved. Twenty-one anxious patients had a 57% improvement rate, which was similar to the figure (61%) for the 18

depressives. One patient died from a pulmonary embolus 4 months post-operatively; she is indicated separately as one of the depressives on the table.

An unexpected finding was that of 15 patients suffering from schizophrenia or schizo-affective disorders : 73% improved. There was usually little change in the underlying schizophrenic process but the affective component, i.e. anxiety or depression, or the obsessional component of the illness improved, and the patients were appreciably less distressed by their symptoms. Of the other diagnostic categories listed, worthwhile improvement generally did not occur. The results in anorexia nervosa have not been encouraging.

The clinical ratings appear to be a valid measure of change. When pre- and post-operative psychometric scores were **retrospectively** determined for each clinical category at follow-up, it was found that before surgery the mean scores were very similar (Table 2). There was no significant difference between the mean **pre-operative** score of the categories for Neuroticism (Maudsley Personality Inventory) or Depression.

TABLE II
Clinical Ratings at Follow-Up With Pre- And Post-Operative Mean
Neuroticism And Depression Scores

Clinical ratings	I Symptom Free	II Much Improved	III Improved	IV Not Improved	V Worse	F
Pre-operative						
Neuroticism (M.P.I.)	30	35	32	33	36	NS
Beck Depression	22	27	26	29	32	NS
Hamilton "	17	25	23	25	26	NS
Middlesex "	9	10	10	10	11	NS
Self-rating "	5	6	5	6	7	NS
Observer-rating "	5	6	5	6	7	NS
Post-operative						
Neuroticism (M.P.I.)	10	24	26	34	40	.001
Beck Depression	4	13	20	27	44	.001
Hamilton "	3	11	16	24	33	.001
Middlesex "	3	7	7	9	10	.001
Self-rating "	1	3	5	6	8	.001
Observer-rating "	1	3	4	6	7	.001

Twenty months **post-operatively**, however, there were highly significant differences between the patients who were rated symptom Free and those rated as Worse. On the Neuroticism scale those rated as Symptom Free had a score of 10, i.e. a 20 point decrease in N score; Much Improved had a score of 24, i.e. an 11 point decrease improved had a score of 26, i.e. a 6 point decrease while those rated as Not Improved had a score of 34, an increase of one point, and those who were Worse a score of 40, an increase of 4 point.

The findings for **Depression** were very similar, with post-operative values on the Beck Depression Scale (Table 2) as follows: Symptom Free, 18 point fall; Much Improved, 14 point fall; Improved, 6 point fall; Not Improved, 2 point fall; Worse, 12 point increase.

When the total sample of patients was examined, it was found that the pre and post-operative scores on the Middlesex Hospital Questionnaire for **Anxiety, Obsessional, Depressive, Phobic, and Somatic** symptoms were all significantly less at follow-up (Fig. 4).

The obsessional patients were also assessed pre and post-operatively on the Leyton Obsessional Inventory. Post-operatively, **Obsessional Symptoms** and **Traits** had fallen significantly, as well as **Resistance** (the distress caused by symptoms) and **Interference** (intrusion caused by symptoms) $p < .001$.

ASSESSMENT OF INTELLECTUAL FUNCTION PRE AND POST OPERATIVELY

There was no fall in IQ on the Wechsler Adult Intelligence Scale as a result of surgery. The mean values for **Verbal** and **Performance** as well as **Full Scale** IQ had in fact increased (see difference column on right of Table 3) 6 weeks post-operatively. Practice effects, generally observed when the WAIS is repeated are probably largely responsible for this. There was no fall-off in any of the sub-scales on the WAIS, indeed all the **Performance** sub-scales increased significantly, as did two of the **Verbal** sub-scales.

Middlesex Hospital Questionnaire

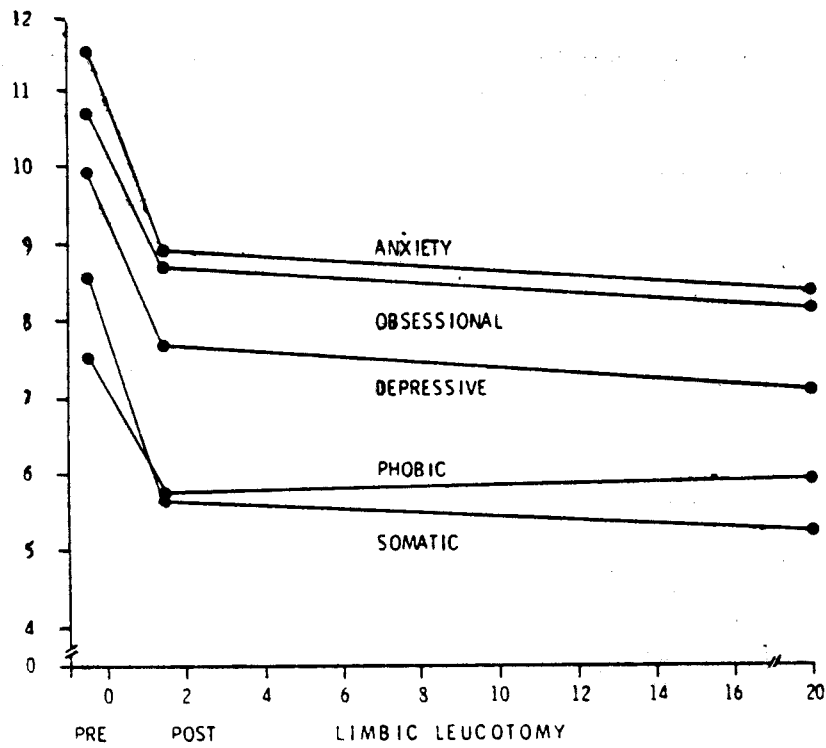


Fig. 4: Mean pre and post-operative scores at 6 weeks and 20 months.

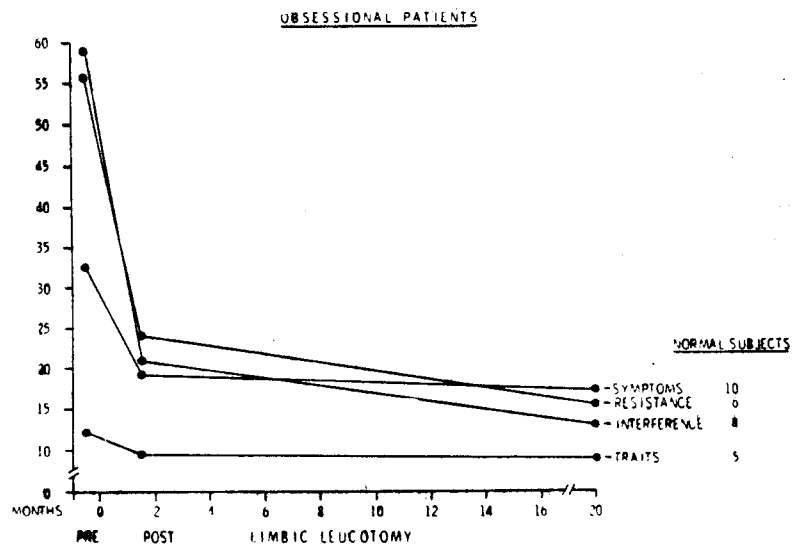


Fig. 5: Mean pre and post-operative scores on the Leyton Obsessional Inventory at 6 weeks and 20 months.

TABLE III

The Mean Scores On The Wechsler Adult Intelligence Scale Before
And 6 Weeks After Limbic Leucotomy (N = 88)

	Before	After	Difference	P
Verbal IQ	106.5	109.7	+ 3.2	.01
Performance IQ	96.7	101.1	+ 4.4	.001
Full scale IQ	102.3	105.8	+ 3.5	.001
Verbal sub-scales				
Information	10.4	10.9	+ 0.5	.001
Comprehension	12.6	13.0	+ 0.4	NS*
Arithmetic	9.8	10.4	+ 0.6	.01
Similarities	10.9	11.2	+ 0.3	NS
Digit span	9.5	9.8	+ 0.3	NS
Vocabulary	12.5	12.7	+ 0.2	NS
Performance sub-scales				
Digit symbol	7.4	7.8	+ 0.4	.05
Picture completion	9.2	9.8	+ 0.6	.001
Block design	9.3	9.7	+ 0.4	.05
Picture arrangement	8.5	9.2	+ 0.7	.01
Object assembly	8.6	9.6	+ 1.0	.001

*NS: Not significant.

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الموجز

خبرات جديدة فى مجال جراحة الطب النفسى

قام الباحثون بتحليل بيانات مائة مريض أجريت لهم جراحة فى المخ (الجهاز الطرفى) بطريقة الاستريوتاكتيك ، ولقد كان هؤلاء المرضى يعانون من مرض نفسى شديد ولم يستجيب لأنواع العلاجات الأخرى . ولقد خلص البحث الى النتائج الآتية :

- ١ - اسفرت الجراحة عن معدل تحسن كلى قدره ٦٧٪ .
- ٢ - لم يحظ ثلث المرضى بفائدة تذكر .
- ٣ - كانت النتائج حسنة بصورة خاصة فى حالة عصاب الوسواس القهرى ، بينما لم تكن كذلك فى حالة الاكتئاب .
- ٤ - ان طريقة التقويم التفصيلية التى اتبعت فى هذا البحث تسمح بمقارنة أنواع جراحة الطب النفسى التى تختلف فيما بينها فى موضع الشق الجراحى .
- ٥ - ان طرق الاستريوتاكتيك تمتاز بالشق الجراحى الصغير بدرجة عالية من الدقة ، وبالتالي فان معدل الوفاة يتضاءل الى الصفر تقريبا .
- ٦ - هناك المزيد من البحث المفيد الذى يمكن عمله لادخال تحسينات على طرق اختيار المرضى ، والتقنيك الجراحى والتقويم السيكاترى (الطب النفسى) والسيكلوجى (النفسى) .

ABSTRACT

Une Nouvelle Expérience de la Leucotomie limbique

Les données de 100 patients qui ont subi des leucotomies stéréotactiques dans le système limbique ont été analysées. Tous ces patients souffraient de maladies psychiatriques qui étaient intraitables. Les conclusions des auteurs ont été les suivantes: (1) la leucotomie limbique produit un taux total d'amélioration de 67%. (2) D'autre part le $\frac{1}{3}$ des patients n'ont pas profité de cette intervention chirurgicale. (3) Les résultats dans les névroses obsessionnelles ont été particulièrement bons par ailleurs ceux de la dépression laissent à désirer (4) La méthode détaillée de l'évaluation qui y est décrite, permet de faire des comparaisons avec d'autres lésions placées autre part. (5) La méthode stéréotactique donne la possibilité de localiser avec une **grande précision** des lésions qui sont plus petites de là le risque de mort est réduit à zéro. (6) Des travaux de plus grande valeur peuvent être accomplis pour raffiner les méthodes de sélection des patients, la technique chirurgicale et l'évaluation psychologique et psychiatrique.