Psychiatric morbidity after surgery for epilepsy: short term follow up of patients undergoing amygdalohippocampectomy

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Abstract

The aim was to assess the occurrence and type of psychiatric disorders of patients with medically intractable epilepsy in relation to surgical treatment, with special reference to amygdalohippocampectomy (AHE). The design was a retrospective psychiatric interview study, including Present State Examination (PSE) and diagnostic classification according to the International Classification of Diseases—8th revision (ICD-8) and ICD-10.

Forty seven (94% of total) patients operated on between 1987 and mid-1991 in the Danish epilepsy surgery programme were studied. The main group of interest included 37 patients treated by AHE. The presence of psychiatric disorders before and after operation was assessed by PSE (including the Catego classification) and by ordinary clinical procedures, making use of all available information (hospital case notes and presurgical psychiatric assessments independent of the study).

Four patients in the AHE group developed depressive disorders of various durations and severity after operation (in three (8%) patients these occurred de novo). One other patient with AHE with a presumed personality disorder who underwent AHE developed a severe depression, as did one patient after a lesionectomy. No patients developed new paranoid hallucinatory psychoses. No association was found between presence of psychiatric disorders and neither right sided cerebral dominance nor histopathological findings.

In conclusion, the postoperative psychiatric morbidity in this sample of patients treated with AHE is of the same magnitude as described in recent series of patients undergoing temporal lobe resection for medically intractable epilepsy. Likewise, affective disorders (depressive conditions) constitute the most prominent psychiatric problem after surgery for epilepsy.

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Large scale surgical treatment of patients with medically intractable epilepsy has been performed over the past 50 years. Resection of the anterior part of the temporal lobe is—together with "tailored" resection—the predominant operation in the treatment of patients with a temporal lobe focus, but in some centres amygdalohippocampectomy (AHE) is performed as a first choice operation. Both procedures are known to carry a high success rate in terms of freedom from seizures,[1 2] but it has been argued that AHE leads to fewer side effects, notably less neuropsychological and psychiatric complications, due to removal of less tissue.[3] At present, however, only limited studies have dealt with these aspects of AHE.[4 5]

The main purpose of the study is to describe short term changes in psychiatric state in patients treated surgically for intractable (partial) epilepsy. Special attention is paid to AHE.

This is a follow up study with all the limitations inherent in such a design. Because of the sparse previous documentation of psychiatric aspects of AHE, however, we consider it to be worthwhile to convey our findings.

Subjects and methods

CLINICAL INVESTIGATIONS

Since 1987 activity in surgery for epilepsy in Denmark has been centred around the Epilepsy Surgery Group, based on Hvidovre Hospital and the Epilepsy Hospital in Dianalund with affiliations to a number of specialised units in the Copenhagen area.

Up to mid-1991 69 adults (patients 18 or older at the time of follow up) who had medically intractable epilepsy with partial seizures with or without secondary generalisation had entered a stepwise evaluation that ultimately led to surgical treatment. Localisation of focus was determined by a standard evaluation with interictal and ictal video monitored scalp EEG, SPECT, CT and MR, Wada test, routine psychiatric evaluation, and neuropsychological testing.

SUBJECTS

All 69 patients were invited to participate in a postoperative evaluation with a one year minimum follow up period. In 50 patients the evaluation led to operation, and 19 patients were dismissed from the programme for various reasons (for example, the presence of bilateral foci, divergent findings concerning hemispheric localisation of focus, psychiatric disturbances incompatible with surgical treatment, or simply because of the patients' own resistance towards the treatment). Forty seven (94%) operated and nine (47%) non-operated patients agreed to participate.

Among operated patients one refused to participate and two patients could not be reached for geographical reasons (they lived on the Faroe Islands and Greenland). The group of non-operated patients was small, less than 50% were willing to participate, and several were excluded from operation for psychiatric reasons, which made it a less suitable group for comparison in a study of psychiatric outcome. Thus we have chosen to limit the presentation to available data on patients who have been operated on within the framework of the Epilepsy Surgery Group.

The study was approved by the scientific ethical committee for the Copenhagen and Frederiksberg Districts. Written informed consent was obtained from all participants.

OPERATION

The standard surgical procedure was selective AHE via entrance through the hippocampal uncus. This was performed as the only operation in 37 patients, in whom no focal lesions were found during the preoperative evaluation. The remaining 10 patients formed a heterogenous group: two patients, initially treated with AHE, underwent temporal lobe resection and one patient had an additional extratemporal resection performed. Six patients had a lesion on MRI (five patients had a tumour and one had a vascular malformation with a calcified haemorrhage), of whom three had a lesionectomy, two an anterior temporal lobe resection, and one an AHE. Finally, one patient, who eight years earlier had had a temporal lobe resection, underwent a frontal and temporal tailored cortical resection.

PSYCHIATRIC METHODS

The clinical part of the study consisted of a clinical and a psychiatric interview using the Present State Examination (PSE), version 9,[6] carried out by one of two authors (ASN or LK) who were both trained in the use of PSE. Information about former psychiatric disorders were acquired through an interview, the preoperative psychiatric assessment notes and—when obtainable—from hospital records. The psychiatric evaluation before the operation was done by one of several psychiatrists at the local psychiatric department and was not standardised for the purpose of the present study. The aim of this evaluation was to disclose psychiatric contraindications.

At follow up, psychiatric diagnoses or syndrome profiles were formulated along two lines. Psychiatric disorder or symptomatology present at the time of the follow up interview was assessed according to the rules laid down in the PSE interview and its related Catego program. An additional procedure of classification followed ordinary clinical practice, making use of all available information. Thereby all patients were assigned none, one, or more psychiatric diagnoses before and after operation, with the criteria laid down in the International Classification of Diseases—10th revision (ICD-10, chapter V).[7]

STATISTICAL METHODS

Non-parametric statistics were used throughout, except for an approximative t test for independent groups for comparing estimated total number of seizures. Categorical data were treated with ordinary χ^2 test or Fisher's exact test for contingency tables, and data on interval scales were analysed with the Mann-Whitney test for two independent groups. A significance level of $p \leqslant 0{\cdot}05$ is used throughout the study.

Results

The data on 47 operated patients is presented, with special attention paid to the core group of 37 patients who underwent AHE. The remaining 10 patients are referred to as "others". The 47 patients represent 94% of a total of 50, who were operated on within the period of interest (1987 to mid-1991).

EPILEPSY, DEMOGRAPHIC, AND SOCIAL VARIABLES

Table 1 describes the basic characteristics of the sample. In the entire sample, 26 patients (55%) were completely free from seizures at the time of follow up (Engel's classification of outcome stage 1[1]). Most still received antiepileptic medication. Of 21 patients still having seizures at follow up, 11 (24%) had had a reduction in seizure frequency (Engel stages 2–3), and seizure frequency was unchanged in the remaining 10 (22%; Engel stage 4).

The distribution of sex, age at follow up, duration of follow up after operation, age at onset of epilepsy, duration of epilepsy, and age at operation did not differ significantly between seizure free and non-seizure free

Table 1 Basic epilepsy related characteristics of subjects included in the study

	AHE	*Others*	*Total*
Subjects (n)	37	10	47
Men/Women (n(%))	22/15 (59·5/40·5)	4/6 (40/60)	26/21 (55·3/44·7)
Age at onset of epilepsy (y, mean (SD))	11·5 (10·3)	13·7 (7·2)	12·0 (9·7)
Duration of epilepsy (y (SD))	17·6 (8·2)	14·8 (8·1)	17·0 (8·2)
Total estimated number of seizures (mean (SD))	5938 (8580)	6559 (9679)	6070 (8718)
Age at (last) operation (y, mean (SD))	29·1 (9·1)	28·5 (8·4)	29·0 (8·9)
Duration of follow up (months, mean (SD))	23·5 (11·9)	20·2 (8·0)	22·8 (12·1)
Age at follow up (y, mean (SD))	31·3 (9·1)	30·7 (8·0)	31·2 (8·8)
Surgical outcome (seizure free/non-seizure free, n (%))	17/20 (46/54)	9/1 (90/10)	26/21 (55·3/44·7)

Table 2 Civic and employment state before and after surgical treatment

	AHE	*Others*	*Total*
Subjects (n)	37	10	47
Civic state before/after operation (n (%)):			
Single	17/16 (46·0/43·2)	4/4 (40·0/40·0)	21/20 (44·7/42·5)
Married/cohabiting	17/14 (46·0/37·8)	5/4 (50·0/40·0)	22/18 (48·8/38·3)
Divorced	3/7 (8·0/19·0)	1/2 (10·0/20·0)	4/9 (8·5/19·2)
Employment state before/after operation (n (%))			
Full time paid or in education	22/22 (59·4/59·4)	7/7 (70·0/70·0)	29/29 (61·7/61·7)
Unemployed, sick leave, or pension	15/15 (40·6/40·6)	3/3 (30·0/30·0)	18/18 (38·3/38·3)

patients in the AHE group. Estimated total number of seizures (seizure frequency before operation multiplied by duration of illness) was lower in the seizure free group (mean 3134 (SD 2575)) compared with the non-seizure free group (mean 8321 (10 995)), but this difference was not statistically significant (*t* test for independent groups p = 0·055).

Minor changes in civic and employment state took place after operation (table 2). In the AHE group, four patients became divorced (two seizure free and two non-seizure free), as did one patient in the group of "others". The proportion of full time employed subjects remained unchanged after operation. As well as four patients who received a disablement pension before operation, three other patients were applying for or had been granted a pension at the time of follow up.

Table 3 PSE subscores

	Amygdalohippocampectomy		
	Seizure free	*Non-seizure free*	*Others*
Subjects (n)	17	20	10
Delusional and hallucinatory syndromes (mean (SD))	0·0 (0·09)	0·4 (1·2) (NS)*	0·0 (0·0)
Behaviour, speech, and other syndromes (mean (SD))	0·6 (1·5)	1·5 (2·6) (NS)*	0·2 (0·4)
Specific neurotic syndromes (mean (SD))	1·4 (3·8)	2·7 (3·1) (NS)*	0·8 (1·4)
Non-specific neurotic syndromes (mean (SD))	3·5 (6·6)	6·2 (5·6) (NS)*	2·2 (2·6)
Total score (mean (SD))	5·5 (11·4)	10·8 (9·7) (p < 0·05)*	3·2 (4·2)

* Mann-Whitney test, seizure free *v* non-seizure free groups.

Table 4 Catego diagnosis at follow up

	Amygdalohippocampectomy		
	Seizure free	*Non-seizure free*	*Others*
Subjects (n)	17	20	10
295·3 Paranoid schizophrenia		2	
296·2 *or* 300·4 Psychotic or neurotic depression	1	4	
300·4 Neurotic depression			1
300·2 Phobic neurosis		3	

Table 5 Presence of psychiatric disorder before and after operation

	Amygdalohippocampectomy		
	Seizure free	*Non-seizure free*	*Others*
Subjects (n)	17	20	10
Psychiatric disorder present only before operation	2	0	2
Psychiatric disorder present only after operation	1	2	1
Psychiatric disorder present before and after operation	2	9*	0
No evidence of psychiatric disorder	12	9	7

* p < 0·05, non-seizure free group *v* seizure free group (Fisher's exact test).

PSYCHIATRIC DIAGNOSTIC FORMULATIONS

Present State Examination and Catego classifications

As well as the Catego diagnoses from ICD-8, we have chosen also to report the subscores derived from the PSE interview and Catego classification.

The PSE subscores are derived by adding the scores of a number of related PSE syndromes. Thus five different scores are obtained: delusional and hallucinatory syndromes, behaviour, speech and other syndromes, specific neurotic syndromes, non-specific neurotic syndromes, and the total PSE score. From table 3 it is seen that only the total score differed significantly between groups of seizure free and non-seizure free patients who underwent AHE, the patients who had AHE obtaining the highest scores. Included in the specific neurotic syndromes subscore are the PSE symptoms: depressed mood, obsessional syndrome, general anxiety, situational anxiety, hysteria, and special features of depression. The non-specific neurotic syndromes subscore comprises depersonalisation, ideas of reference, tension, lack of energy, worrying, irritability, social unease, loss of interest and concentration, hypochondriasis, and somatic symptoms of depression.

Eleven patients reached the PSE-9 threshold level of an Index of Definition of 5 or above, which is the minimum required by the Catego program if it is to suggest a possible diagnosis. Level 1 is defined by the absence of PSE symptoms, levels 2 and 3 by a low total score and presence of only non-specific neurotic symptoms, and ratings at level 4 do not contain enough information to provide a diagnosis. One seizure free (2·7%), nine non-seizure free (24%) AHE patients, and one "others" group (10%) reached the threshold level of an index of definition $\geqslant 5$. Table 4 shows the distribution of Catego diagnoses. Depressive and neurotic disorders dominated at the time of follow up.

CLINICAL PSYCHIATRIC DIAGNOSIS (ICD-10)

When all available information was used, psychiatric disorder was judged to have been present at some time in 19 patients (table 5). Thus in the AHE group two patients had had a psychiatric disorder at some time only before

operation. In three patients, who were assigned a diagnosis postoperatively, no evidence for previous psychiatric morbidity could be found. A total of 11 patients had psychiatric problems before as well as after the treatment, whereas the remaining 21 patients apparently enjoyed good mental health both before and after operation. In the group of "others" three patients had or had had a psychiatric problem at some point.

In the AHE group a higher proportion of non-seizure free patients were found to have one or more psychiatric disorders before and after operation, but the difference was statistically significant only after operation (Fisher's exact test, $p < 0.05$).

The disorders in question covered a broad spectrum of psychiatric disorders—from acute psychotic disorder (F23), mood disorders of various degrees of severity (F30–39),

Table 6 Psychiatric findings in patients operated on

Patient	*Sex*	*Age at operation*	*Operation performed*	*Cerebral dominance*	*Histopathology*	*Outcome*	*Psychiatric disorder before operation*	*Psychiatric disorder after operation*
(A):								
1	M	35	Left AHE	Left (H)	Reactive	Non-sf (2)	F07·0 Organic personality disorder	F07·0 Organic personality disorder
2	F	32	Right AHE	Left (W)	Reactive	Non-sf (4)	F32·0 Mild depressive disorder	F06·0 Organic hallucinosis F41·1 Generalised anxiety disorder or F06·4 Organic anxiety disorder
3	M	21	Right AHE	Left (W)	Reactive	Non-sf (4)	F60·2 Dissociated personality disorder F10·2 Alcohol dependence syndrome	F60·2 Dissociated personality disorder F10·2 Alcohol dependence syndrome F55·2 Abuse of analgesics
4	F	57	Left AHE	Left (H)	Reactive	Non-sf (4)	F06·8 Epileptic psychosis unspecified F02·8 Dementia	F06·8 Epileptic psychosis unspecified
5	F	20	Right AHE	Left (W)	Reactive	Non-sf (2)	F06·2 Organic delusional disorder obs	F06·2 Organic delusional disorder obs
6	M	34	Right AHE	Left (W)	Gliosis	sf (1)	F60·9 Personality disorder unspecified	F32·2 Severe depressive episode without psychotic symptoms F41·1 Generalised anxiety disorder
7	M	27	Left AHE	Left (H)	Reactive	Non-sf (3)	F06·2 Organic delusional disorder F05·0 Delirium, not superimposed on dementia	F06·2 Organic delusional disorder F32·1 Moderate depressive episode
8	M	26	Left AHE	Left (W)	Reactive	sf (1)	F07·0 Organic personality disorder	F07·0 Organic personality disorder
9	F	17	Right AHE	Left (W)	Reactive	Non-sf (4)	F60·9 Personality disorder unspecified	F60·9 Personality disorder unspecified
10	F	34	Left AHE	Right (W)	Gliosis	Non-sf (2)	F60·1 Schizoid personality disorder F60·5 Anankastic personality disorder F50·1 Atypical anorexia nervosa	F60·1 Schizoid personality disorder F60·5 Anankastic personality disorder F50·1 Atypical anorexia nervosa
11	F	27	Right AHE	Left (W)	Gliosis	Non-sf (2)	F71·0 Moderate mental retardation	F71·0 Moderate mental retardation
(B):								
12	M	33	Left AHE	Left (W)	Reactive	sf (1)	F34·1 Dysthmia F60·7 Dependent personality disorder	None
13	M	26	Right AHE	Left (W)	Reactive	sf (1)	F60·2 Dissociated personality disorder tentative F10·2 Alcohol dependence syndrome tentative F12·2 Cannabis dependence syndrome tentative	None
(C):								
14	M	33	Right AHE	Left (W)	Reactive	sf (1)	None	F34·9 Persistent mood disorder, unspecified
15	M	39	Left AHE	Left (H)	Reactive	Non-sf (4)	None	F07·0 Organic personality disorder F06·4 Organic depressive disorder
16	M	28	Right AHE	Left (W)	Gliosis	Non-sf (4)	None	F34·1 Dysthymia
(D):								
17	F	34	Left sided lesionectomy	Left (W)	Tumour (oligodendroglioma)	sf (1)	F33·9 Recurrent depressive disorder	None
18	M	46	Right sided lesionectomy	Left (H)	Calcified vascular malformation	sf (1)	None	F32·2 Severe depressive episode
19	F	32	Right AHE and TLR	Left (W)		sf (1)	F23·9 Acute and transient psychotic disorder	None

Patients were judged to have had a psychiatric disorder at some time. TLR = temporal lobe resection; sf = seizure free; non-sf = non-seizure free; Engel's classification in parentheses. Cerebral dominance was determined by Wada test (W) or according to handedness (H). (A) = AHE patients with no or minor changes in psychiatric findings; (B) = AHE patients with a history of psychiatric disorders in whom none were found at follow up. (C) AHE patients without a history of psychiatric disorders who developed such a disorder after surgery. (D) Patients in the group "others" with a psychiatric disorder at some point.

personality disorders (F60), organic hallucinatory or delusional disorder (F06) and organic personality disorder (F07), to dementia (F02–03); table 6 shows the changes in diagnosis.

Thus major changes in psychiatric diagnosis took place in eight patients after operation, five in the AHE group. In two patients no evidence of a previously described psychiatric disorder was found at follow up (table 6(B)). Three patients without psychiatric problems before operation developed a mood disorder, which in one patient was secondary to a severe personality change (table 6(C)). One patient, who had previously sought treatment for a mild depressive disorder, had an organic hallucinosis and a generalised anxiety disorder at follow up, and another patient, who probably had a personality disorder before operation, developed a severe depressive disorder (table 6(A)). In the group of "others" (table 6(D)) one patient had previously had recurrent depressions and another an acute and transient psychotic disorder, but neither of them displayed any psychiatric disorders at follow up. One patient, however, developed a severe depression immediately after the operation.

Of the five patients who developed mood disorders of various severities and duration, four patients were operated on on the right side (in three patients AHE and in one patient a lesionectomy with removal of a calcified vascular malformation); one patient underwent a left sided AHE.

CEREBRAL DOMINANCE, HISTOPATHOLOGY, AND PSYCHIATRIC FINDINGS

To determine cerebral dominance, a one sided amytal test (Wada test) was performed in 31 patients. In four patients the result of the test was inconclusive. In the remaining patients cerebral dominance was determined by handedness. In one patient no information was available. Thus the left hemisphere was found to be the dominant hemisphere in 37 patients and the right hemisphere was dominant in five patients (table 7). Of the 19 patients who had a psychiatric disorder before or after operation, only one patient had a right sided cerebral dominance (table 6(A), patient 10).

The histopathology of removed tissue was described as gliosis in nine cases, reactive changes in 29, and alien tissue in six (table 8). In one case no abnormalities were found, and in the remaining two cases no information was available. Alien tissue was found in two of 19 psychiatric cases (table 6(D), patients 17 and 18), and the histopathological findings in the remaining 17 cases were reactive changes in 15 and gliosis in two.

Table 7 Psychiatric findings and cerebral dominance

	Cerebral dominance		
	Right sided	*Left sided*	*Inconclusive or no information*
Psychiatric disorder ever	1	18*	
Psychiatric disorder never	4†	19‡	5

$p < 0{\cdot}35$, Fisher's exact test.
An amytal test was performed on 32 patients. In the other cases determination of cerebral dominance was based on handedness only: *Five cases; †two cases; ‡eight cases.

Table 8 Psychiatric findings and histopathology

	Histopathology		
	Reactive changes	*Gliosis*	*Alien tissue*
Psychiatric disorder ever	15	2	2^{ab}
Psychiatric disorder never	14	7	4^{c-e}

a = Oligodendroglia; b = calcified vascular malformation; c = astrocytoma grade 2; d = astrocytoma (juvenile type); e = astrocytoma. There was no significant difference in presence of alien tissue between psychiatric disorder ever and psychiatric disorder never groups.

Discussion

The purpose of this study was to describe short term changes in psychiatric state in patients treated by AHE because of medically intractable seizures. The study has some methodological drawbacks, the most important being the uncertain reliability of presurgical psychiatric conditions and diagnosis.

It can be argued that the duration of the follow up period was too short to identify all possible changes in psychiatric state. It has been suggested, however, that most psychiatric disorders appear within the first year or two after operation.[8]

The choice of PSE-9 as the only diagnostic instrument can be questioned, so we decided to implement a second line of diagnosis, with ordinary clinical procedures and making use of all available information. When PSE is strictly followed, major areas of psychopathology are not considered, most notably aspects of personality, and problems also arise when dealing with previous or long lasting psychiatric disorders. In these cases, PSE classification and diagnoses will not necessarily coincide with the appropriate clinical diagnoses because much relevant clinical information will be left out. Finally, the Catego program generates diagnoses only in ICD-8 terms. On the other hand, the PSE interview and the Catego program have the advantages of being structured and standardised instruments, which, as well as the diagnostic formulation, offer psychopathology profiles on various levels.

Most of the medical literature concerning psychiatric aspects of surgery for epilepsy stems from a time when the presence of psychiatric problems among candidates for surgical treatment seemed to be the rule rather than the exception.[9–12] Thus in earlier studies it is not uncommon to find that two thirds or more of the patients with temporal lobe resection disclosed one or more psychiatric disorders before operation. Bearing in mind that patients were often referred for surgery for epilepsy from psychiatric institutions, this is not surprising. Changes and variations in methodology and diagnostic classification make comparisons between studies difficult, but several attempts have been made to determine the prevalence of various psychopathological findings in series of patients undergoing temporal lobe resection. Thus in a recent review of the medical literature an

attempt was made to average across studies.[13] Disturbances of general psychiatric and psychological adjustment are said to be present in 67% of patients in whom improvement occurs in two thirds after operation. More specific psychiatric disorders are described in terms of psychoses in about 15% of patients both before and after operation, depression, anxiety, or suicidal tendencies in 20% before operation, aggression in 37% with improvement in about half, sexual dysfunction in 50% with improvement in 60%, and major difficulties in work adjustment in most patients, with postoperative improvement in 60%. Only a few of the quoted studies (about 10%) have been published within the past decade.

The level of psychiatric morbidity found before and after operation in the present study is of the same magnitude as described in other more recent follow up studies of patients treated with temporal lobe resection. Thus three of 37 AHE patients developed a psychiatric disorder for the first time after operation (8%).[14–16]

The psychiatric morbidity reported in this and other newer series of psychosocial outcome after temporal lobe resection is much lower both before and after operation than described in earlier studies. This discrepancy is likely to reflect differing criteria for selection of candidates for operation, and that the sources of referral have moved away from psychiatric institutions. The role of AHE compared with temporal lobe resection with respect to psychiatric findings is uncertain, but it has been presumed that removal of less tissue could lead to fewer neuropsychological and psychiatric side effects. Considering the importance of the amygdaloid-hippocampal complex in the regulation of emotions and affect, however,[17] it would not be surprising if differences between the two treatment modalities were negligible, and in a recent comparative study of neuropsychological aspects of the two procedures, no major differences appeared.[4]

The psychiatric morbidity is still relatively high in this and other series, however, and within the past 15 years especially, the potential risk of developing a postoperative psychosis de novo has been focused on.[8 18–20] Thus in a previous Danish follow up study,[21] more than 10% of patients developed delusional disorders after the operation, and an up to date figure of severe psychiatric disorder occurring postoperatively in 7% has been suggested. Whereas focus has previously been on the occurrence of paranoid-delusional psychoses, it has become clear that the occurrence of affective disorders may be of equal or even greater importance,[22] which again might reflect changes in the selection of candidates for operation.

In the present study no patients developed paranoid-delusional psychoses within the follow up period. Our finding of affective disorders as the predominant psychiatric problem after operation is in accordance with other recent studies. The relevance of right sided operations in (four of five) patients who developed a depressive disorder is uncertain.

In an earlier study the presence of alien tissue (by contrast with mesial sclerosis) and left handedness were found to be associated with a high level of psychiatric morbidity (particularly schizophrenia-like psychosis) after temporal lobe resection.[23] Our findings do not support an association between these factors and the presence of psychopathology in general. The number of cases in this series is limited, however. Furthermore, the histopathological examination was hampered by the operational procedure, whereby the tissue is sucked out from the operational cavity, rather than removed en bloc.

The influence of outcome in terms of freedom from seizures on psychiatric morbidity cannot be assessed from the present study, although more psychiatric cases were found in the group of patients who did not become seizure free.

In the medical literature and among centres offering surgical treatment for drug resistant epilepsy there is no consensus about the necessity of psychiatric evaluation before and after operation, or which instruments should be used for assessing psychopathology.[24] In our opinion a psychiatric assessment—and if necessary, intervention—should be as natural a part of the assessment before and after operation as, for example, neuropsychological evaluation, as we consider it to be an equally important aspect in the total picture of psychosocial outcome. We chose to follow the European tradition in the choice of ICD for diagnostic classification and its related instrument, PSE. At the time of the study only PSE-9 was available, which is why the initial formulations were done with ICD-8. In future studies we would recommend the use of PSE-10, and a thorough assessment of personality features and disorders. Also, a prospective design including presurgical evaluation should be mandatory.

It has been suggested that studies of psychiatric consequences and psychosocial outcome ideally should include all patients entering a programme for surgery for treatment of epilepsy.[25] In the present study we chose to exclude the non-operated patients. We did not find this group to be suitable for comparison because of a high prevalence of psychiatric disorders, this being the reason for exclusion from operation in some patients.

In conclusion, the present findings of severe psychopathology arising in three patients (8%) after AHE for medically intractable epilepsy, is in line with the findings from a recent survey among centres offering temporal lobe surgery (mainly resection). One aim for future psychiatric research should be—in collaboration with other disciplines—to delineate the group of patients who carry the greatest risk of developing psychiatric complications (especially lasting ones) after operation. Thus necessary preventive precautions can be taken, either by abstaining from carrying out the operation or providing

sufficient postoperative social, psychological, and psychiatric care and treatment. In that way the proportion of psychiatric cases and psychosocial problems arising postoperatively may gradually diminish further.

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1 Engel J. Outcome with respect to epileptic seizures. In: Engel J, ed. *Surgical treatment of the epilepsies*. New York: Raven Press 1987:553–71.
2 Wieser HG. Selective amygdalohippocampectomy: indications, investigative technique, and results. *Adv Tech Stand Neurosurg* 1986;**13**:40–133.
3 Wieser HG. Selective amygdalo-hippocampectomy for temporal lobe epilepsy. *Epilepsia* 1998;**29**(suppl 2):S100–13.
4 Goldstein LH, Polkey CE. Short term cognitive changes after unilateral temporal lobectomy or unilateral amygdalohippocampectomy for the relief of temporal lobe epilepsy. *J Neurol Neurosurg Psychiatry* 1993;**56**:135–40.
5 Wieser HG. Behavioural consequences of temporal lobe resections. In: Trimble MR, Bolwig TG, eds. *The temporal lobe and the limbic system*. Petersfield: Wrightson Biomedical Publishing Ltd, 1992:169–88.
6 Wing JK, Cooper JE, Sartorius N. *Measurement and classification of psychiatric symptoms. An instruction manual for the PSE and Catego program*. Cambridge: Cambridge University Press, 1974.
7 World Health Organisation. The ICD-10 classification of mental and behavioural disorders. Clinical descriptions and diagnostic guidelines. Geneva: WHO, 1992.
8 Stevens JR. Psychiatric consequences of temporal lobectomy for intractable seizures: a 20–30 year follow-up of 14 cases. *Psychol Med* 1990;**20**:529–45.
9 Taylor DC. Mental state and temporal lobe epilepsy. *Epilepsia* 1972;**13**:727–65.
10 Jensen I, Larsen JK. Mental aspects of temporal lobe epilepsy—follow-up of 74 temporal lobe resected patients. *J Neurol Neurosurg Psychiatry* 1979;**42**:256–65.
11 Taylor DC. Aggression and epilepsy. *J Psychosom Res* 1969;**13**:229–36.
12 Walker AE, Blumer D. Behavioral effects of temporal lobectomy for temporal lobe epilepsy. In: Blumer D, ed. *Psychiatric aspects of epilepsy*. Washington DC: American Psychiatric Press Inc, 1984:295–324.
13 Strauss E, Wada J. Psychiatric and psychosocial changes associated with anterior temporal lobectomy. In: Devinsky O, Theodore WH, eds. *Epilepsy and behavior*. New York: Wiley-Liss, 1991:135-49.
14 Hefner G, Elger CE, Burr W, Hufnagel A, Zentner J, Schramm J. Psychosocial and psychiatric outcome after temporal lobe resections in epilepsy patients (abstract). *Epilepsia* 1993;**34**(suppl 2):67.
15 Stagno SJ, Nangle RI, Roca C, Dechman J, Morris HH. Neuropsychiatric disorders occuring in patients after surgery for epilepsy (abstract). *Epilepsia* 1993;**34**(suppl 2):67.
16 Starmark JE, Malmgren K, Holmberg B, Rosén H. Organic and functional psychiatric syndromes in patients evaluated for epilepsy surgery (abstract). *Epilepsia* 1993;**34**(suppl 2):156.
17 Fonberg E. Amygdala, emotions, motivation, and depressive states. In: Plutchik R, Kellerman H. eds, *Biological foundations of emotion*. Vol 3. New York: Academic Press, 1986:301–31.
18 Trimble MR. Behavior changes following temporal lobectomy with special reference to psychosis. *J Neurol Neurosurg Psychiatry* 1992;**55**:89–91.
19 Mace CJ, Trimble MR. Psychosis following temporal lobe surgery: a report of six cases. *J Neurol Neurosurg Psychiatry* 1991;**54**:639–44.
20 Koch-Weser M, Garron DC, Gilley DW, *et al*. Prevalence of psychological disorders after surgical treatment of seizures. *Arch Neurol* 1988;**45**:1308–11.
21 Jensen I, Larsen JK. Psychoses in drug-resistant temporal lobe epilepsy. *J Neurol Neurosurg Psychiatry* 1979;**42**:948–54.
22 Bruton CJ. The neuropathology of temporal lobe epilepsy. In: *Maudsley monograph No 31*, Oxford: Oxford University Press. 1988.
23 Taylor D. Factors influencing the occurrence of schizophrenia-like psychosis in patients with temporal lobe epilepsy. *Psychol Med* 1975;**5**:246–54.
24 Fenwick PBC. Postscript: what should be included in a standard psychiatric assessment? In: Engel J, ed. *Surgical treatment of the epilepsies*. New York, Raven Press 1987:505–10.
25 Fenwick PBC. Psychiatric assessment and temporal lobectomy. *Acta Neurol Scand* 1988;suppl 117:96–102.