Maintenance electroconvulsive therapy and cognitive function

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Background ECT is rarely used as a prophylactic treatment. A 74-year-old woman with unstable bipolar affective disorder receiving maintenance ECT presented a unique opportunity to measure the cognitive effects of continuing ECT.

Method A single case report with serial psychometric testing during over 400 ECT treatments as a single maintenance treatment.

Results Serial testing did not demonstrate progressive cognitive deterioration, but consistent cognitive deficits typical of acute treatment were evident. The degree of cognitive difficulty may be related to the frequency of treatment.

Conclusions Maintenance ECT can be an effective prophylactic treatment for selected patients. Cognitive effects would appear to be no greater than with acute treatment and seem to be non-progressive.

Prior to effective drug treatments maintenance electroconvulsive therapy (ECT) was a frequently used form of prophylaxis (Stevenson & Geoghegen, 1951) but its popularity declined. One concern about ECT is the adverse effect on cognitive function, although research suggests that standard courses of treatment have little or no enduring effect on cognitive performance (Caley *et al*, 1995). Since the number of subjects undergoing prolonged ECT is small there is little information on the risk that continuation or maintenance treatment poses to intellectual function.

We report the case of an elderly patient who has now received over 420 individual treatments in a single, continuous course of maintenance ECT. During this time psychometric testing has been serially performed.

CASE REPORT

A 74-year-old woman was first admitted to a psychiatric hospital in 1965, aged 43, and diagnosed as suffering from schizophrenia. Her second admission in 1969 was also considered as schizophrenia and she was treated with ECT. The records of these episodes cannot be traced.

Available records begin with an admission in 1975 when she presented with delusional depression. Mental state examination at the time revealed a severely depressed, semi-stuporous woman with delusions of guilt. She responded well to ECT and amitriptyline. She relapsed within six months and despite pharmacological intervention was readmitted and treated successfully with ECT.

She required admission twice in 1976, totalling seven months, and in 1977 there were two admissions totalling eight months, one of these being the first documented episode of hypomania.

Despite prophylactic treatment with various combinations of tricyclic antidepressants, mianserin, tryptophan, monoamine oxidase inhibitors, lithium salts, carbamazepine, thyroxine and neuroleptics, she was admitted every year from 1978 to 1984 spending the equivalent of 3.5 years in hospital with admissions ranging from two to 10 months' duration. She was almost permanently hospitalised for four years between 1984 and 1989. A review of treatment indicated ECT had been the only consistently effective method of controlling her mood disorder and in 1989 the decision was taken to begin maintenance ECT twice weekly. She was quickly discharged to residential accommodation and apart from a three-week period in 1990 has never required hospitalisation since. A computed tomographic brain scan in 1989 revealed mild cortical atrophy.

Early attempts to reduce the frequency of treatments to less than weekly resulted in relapse with delusions of guilt and social withdrawal. In 1993 ECT was successfully reduced to fortnightly but in 1994 a further reduction to three- then four-weekly precipitated recurrence of depressed mood, agitation, delusions of guilt, self-recrimination and morbid preoccupation. Increasing treatment to weekly without recourse to admission successfully abolished all symptoms and for 18 months she has remained symptom-free on fortnightly treatments. It is observed that during the 48 hours before treatment she becomes agitated and expresses ideas of guilt.

Psychometric testing was performed in 1988, shortly after maintenance ECT began, and was repeated in 1990, 1993 and 1996. Though a verbal IQ was established in 1987 it had proved impossible to engage her in further testing and useful baseline measures are not available. At the time of testing in 1989 and 1990, ECT was being administered twice weekly, and in 1993 weekly. When tested in 1996 she had been receiving fortnightly ECT for 18 months and by this time had received a total of 430 treatments. Her present medication is fluoxetine 40 mg daily, lorazepam 3 mg t.d.s., glibenclamide 5 mg b.d. and thyroxine 100 μg daily. This has not changed significantly during the period of maintenance treatment, although fluoxetine was introduced only in 1992.

ELECTROCONVULSIVE THERAPY ADMINISTRATION

ECT was administered with standard bifronto-temporal electrode placements and in accordance with Royal College of Psychiatrists' guidelines (1989). The first 320 treatments were given using an Ectron

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Duopulse constant current device producing a visible bilateral motor seizure of 20–50 s duration. Subsequent treatments have employed a Mecta SR2 ECT device with mean stimulus dose of 273 mC. Seizure duration recorded with bilateral EEG monitoring has been 15–20 s and allowed to be of shorter duration as clinical state has been stable. Anaesthetic agents have varied but mostly involve induction with intravenous methohexitone, intravenous suxamethonium as muscle relaxant and 100% oxygen.

PSYCHOMETRY RESULTS

All testing was performed by a clinical psychologist and on the past two occasions by one author (D.P.), a consultant for the elderly. The patient was assessed using standard psychometric instruments on five occasions between 1987 and 1996. The 1987 assessment was limited by the patient's distress in the test situation. A summary of results is presented in Table 1.

On each test occasion the patient demonstrated severe recall difficulties for long-term autobiographical memory, and "I don't know" responses but no confabulation. The relative absence of premorbid measurement and limitations of the predictive value of the National Adult Reading Test (NART; Nelson, 1982) in this case makes precise judgement of early abilities difficult. However, information from her family indicates premorbid intellectual limitations. She was considered 'slow' at school but was able to read and write. Her only employment was helping in the local market. She made 49 errors in the NART indicating a numerical IQ in the mid-upper seventies (borderline subnormal) although precise IQ levels are poorly predicted at low levels.

Assessment using the revised Wechsler Adult Intelligence Scale (WAIS-R; Wechsler, 1981) showed uniform subtest performance indicating subnormality, with the exception of significantly higher scores on three verbal and one performance test including Block Design and Similarities, which would usually be particularly vulnerable to deterioration in most progressive dementias. This general finding was reproduced on each of the four test occasions with an absolute increase of total IQ.

Table 1 Psychometric test results

Year	1987	1989	1990	1993	1996
Frequency of ECT		Twice weekly	Twice weekly	Weekly	Fortnightly
Summed ECT no.		20	80	350	430
Verbal IQ[1]	58	65	58	61	70
Performance IQ[1]		64	60	61	65
Full IQ[1]		63	55	60	67
Sub-test of WAIS-R; age-corrected scores					
Information		4	2	2	3
Digit span		6	1	3	4
Vocabulary		5	1	2	3
Arithmetic		3	3	4	5
Comprehension		2	2	2	6
Similarities		3	5	5	6
Picture completion		4	2	2	3
Picture arrangement		2	2	2	2
Block design		3	3	5	5
Object assembly		5	1	2	3
Digit symbol		1	1	1	4
Logical memory percentile equivalent[2]					
Immediate recall		6	11	14	11
Delayed recall		1	1	2	2
Kendrick object learning test (age-scaled quotient)				71	75

1, Derived from the Wechsler Adult Intelligence Scale (WAIS-R).
2. Derived from Wechsler Memory Scale, revised manual (Wechsler, 1987).

Learning and memory were formally and serially tested using the logical memory subtest of the Wechsler Memory Scale (Wechsler, 1987). This is a measure of verbal memory and on all test occasions showed limited immediate recall and no delayed recall. The patient refused to perform tests of non-verbal memory, including the Ray Osterreith Complex Figure or Benton Visual Retention tests by saying "I can't do it" at an early stage. However, the Kendrick Object Learning Test (Kendrick, 1985) was used as a measure of visual/verbal memory in 1993 and 1996. The performance was stable over time, indicating reasonable new learning ability in an immediate recall paradigm, given the measured IQ levels, degree of anxiety, medication and a cautious response style.

Low premorbid abilities limit the scope and clarity of conclusions drawn from standardised testing. Observations about the patient's functional performance over time are also relevant. She remains self-caring within the residential home and day hospital, in which she is topographically oriented and oriented to the day of the week and usually the month and year. She identifies people by name and always knows the day her treatment is due, even though it now occurs only fortnightly.

These observations would indicate that she learns and retains important verbal, visual and visuo-spatial material. Furthermore, care staff who have known her throughout this period consider she is improved.

DISCUSSION

To the authors' knowledge the case described documents the longest continuous course of maintenance ECT reported. The benefits of maintenance ECT to this patient seem fairly clear when considering control of mood disorder and need for hospitalisation. This accords with other reports of its use in treatment-resistant affective disorder (Vanelle *et al*, 1994). The fact that recurrence has been evident only at times when frequency of ECT has been reduced might indicate that the treatment is still exerting important prophylactic effect.

Cognitive function

We are aware of only one comparable case report (Hay & Scott, 1994). Those authors found no evidence of intellectual impairment

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following 125 consecutive treatments but were able to perform only limited testing.

In the present case serial psychometric testing did not reveal evidence of progressive intellectual impairment, although cognitive problems typical of acute ECT treatment were evident. A recent review of the cognitive effects of acute ECT treatment is provided by Calev *et al* (1995).

There are limitations to the present data. We have no objective assessment of the patient's actual premorbid intellectual level and although the IQ measurement in 1987 was derived before maintenance ECT was initiated, it was at a time when her mood disorder was poorly controlled and intermittent courses of ECT were employed. Her profoundly depressed state made detailed psychometric testing at that time difficult to perform and it is clear that severely depressed patients of any age requiring ECT are likely to demonstrate significant cognitive impairment before treatment (Wilkinson *et al*, 1993).

The clinical information would suggest this patient had a life-long low IQ. In addition, recent evidence suggests that chronic manic depressive psychosis itself is associated with acquired neuropsychological impairment demonstrable during remission and particularly affecting memory function (McKay *et al*, 1995).

The patient's generally low scores mean that a 'floor effect' may fail to reveal significant deterioration. However, the most recent test data found an overall improvement in scores, which might support the contention that no progressive deterioration has occurred and that this is not simply due to lack of sensitivity of measuring instruments.

In accepting these limitations we feel it is important not to ignore clinical evidence of functioning. She remains independent in a supportive environment in which she is topographically oriented, able to recall recent events, identify and name people she knows, understand the nature of treatment and knows the day it is due, even now that it occurs only fortnightly. The clinical impression of all carers is one of improvement.

CONCLUSIONS

There has been no quantifiable or qualitative progressive deterioration in cognitive function throughout the period of maintenance ECT in this case. The hypothesis that the patient is suffering from progressive intellectual impairment is not supported by the data or by clinical observations. The patient does demonstrate some new learning and recall difficulties similar to those found with acute ECT treatment. There is suggestive evidence from improved scores in 1996 that reducing the frequency of ECT reduces these cognitive effects. Whether these would resolve entirely if ECT were withdrawn cannot be answered by this case, as attempts to reduce treatment further have been associated with recurrence.

CLINICAL IMPLICATIONS

- Maintenance treatment with ECT can be of prophylactic value in selected cases.
- Prolonged courses of ECT are associated with cognitive problems similar to those found during acute treatment.
- A prolonged course of ECT does not appear to cause progressive intellectual impairment but the degree of cognitive problems may be related to the frequency of treatment.

LIMITATIONS

- Difficulty generalising from a single case.
- Low premorbid intellectual ability may create a 'floor effect' on psychometric performance and miss a real decline.
- No premorbid test results were available.

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