Electroconvulsive Therapy for Catatonia

Treatment Characteristics and Outcomes in 27 Patients

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Objectives: Electroconvulsive therapy (ECT) has been described as an effective treatment option for catatonia in retrospective case series. We aimed to investigate treatment characteristics and outcomes of patients with catatonia who were treated with ECT.

Methods: The medical records of 27 patients with catatonia treated with ECT (between 1991 and 2009) were scrutinized for clinical and treatment characteristics. Outcomes were measured using the Clinical Global Impression—Improvement (CGI-I) scale. Patients who improved (defined as CGI-I score "very much" or "much improved") were compared with those who did not improve (defined as a CGI-I score "no change" or "very much worse").

Results: Mean age of all patients was 49 ± 19 years, of whom 15 (56%) were women. Of all patients, 13 (48%) had a diagnosis of a mood disorder and 12 (44%) of a psychotic disorder. Electroconvulsive therapy was mostly started after ineffective pharmacotherapy (n = 23; 85%) within 2 to 3 months after catatonia had been diagnosed. In total, 16 (59%) patients improved. Improvement was significantly associated with younger age ($P = 0.05$), presence of autonomic dysregulation at baseline ($P = 0.02$), especially higher body temperature ($P = 0.02$), daily ECT during the first treatment week (n = 15 [56%]; $P = 0.03$), longer duration of electroencephalogram seizure activity at last ECT session ($P = 0.04$), and less morbidity in the year after ECT ($P = 0.03$). Three of 11 nonimproved patients died in the year after ECT compared with none of the improved patients.

Conclusions: Most of our patients with catatonia benefited from ECT, especially younger patients with autonomic dysregulation. Daily administration of ECT may be more effective, whereas longer duration of seizure activity at the final ECT session was related to better response to ECT.

Key Words: catatonia, electroconvulsive therapy, outcome, case series

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Catatonia is characterized by motor abnormalities including rigidity, catalepsy, waxy flexibility, mutism, stupor, negativism, posturing, stereotypy, echophenomena, and mannerisms. Catatonia is closely associated with the presence of mood and psychotic disorders and toxic states.[1] The estimated prevalence of catatonia among psychiatric inpatients is reported to range from 8% to 38%; this wide range is possibly due to difficult differential diagnosis from other disorders.[2] Catatonic patients are at risk of severe complications, such as pneumonia, decubitus, malnutrition, dehydration, contractures, and thrombosis. Moreover, patients who experienced malignant variant of catatonia (lethal catatonia or neuroleptic malignant syndrome) show autonomic instability with hyperthermia, tachycardia or bradycardia, hypertension or hypotension, tachypnea, diaphoresis, and cardiac arrhythmia, whereas a high percentage of them ultimately die.[1] In case reports and case series, benzodiazepines and electroconvulsive therapy (ECT) are described as effective treatment options for catatonia. However, data from randomized clinical trials on the effectiveness of these treatments are not available,[3] and large clinical studies are sparse. Therefore, this retrospective study describes patients with catatonia who were treated with ECT.

METHOD

The medical records of all patients treated with ECT (n = 285) at the Rijnstate Hospital (a large teaching hospital in Arnhem, the Netherlands) in the period 1991 to 2009 were retrospectively examined. Of the 27 patients who had a diagnosis of (severe) catatonia, the medical records were scrutinized regarding 3 sets of variables:

1. Patient characteristics, including sex, age, psychiatric diagnosis (according to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*[4]), medical comorbidity, and severity of catatonia with the Clinical Global Impression for Severity (CGI-S) scale.[5] Earlier treated patients (1991–2001; n = 4) were rated using the CGI-S retrospectively from the medical charts by 2 independent psychiatrists; all other 23 patients were rated by the treating psychiatrists before and after treatment. Furthermore, the presence of autonomic dysfunctions was determined according to the presence of hyperthermia (body temperature ≥38°C), tachycardia or bradycardia (≥100 or ≤60 beats per minute, respectively), hypotension or hypertension (systolic blood pressure, ≤90 or ≥140 mm Hg), tachypnea (≥20 breaths per minute), diaphoresis, and/or cardiac arrhythmia. Severe catatonia was defined as, next to catatonia, autonomic dysfunctions and/or alterations of consciousness being presence;
2. Treatment characteristics, including first treatment of catatonia, time interval before any treatment and before ECT, and characteristics of ECT; and
3. Outcome characteristics, including outcomes as assessed with the Clinical Global Impression for Improvement (CGI-I) scale[5] and morbidity and mortality in the year after ECT.

Statistical Analysis

Categorical data are presented as numbers and percentages and continuous variables as mean (SD) values or medians with interquartile ranges when appropriate. Improved patients (defined according to the CGI-I as those rated as "very much" or "much improved") were compared with nonimproved patients (defined according to the CGI-I as those rated as "no

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change," "minimally," "much," or "very much worse") using the χ^2 and Fisher exact tests for frequencies and independent *t* tests for normally distributed continuous variables. The SPSS for Windows version 13.0 (SPSS Inc, Chicago, Ill) was used for all analyses, and the level of significance was set at $P \leq 0.05$.

TABLE 1. Baseline Characteristics of the Study Population (n = 27)*

Demographic Characteristics	
Female	15 (56)
Age, mean (SD), range, yr	49.1 (19.2), 19–84
Clinical characteristics	
Psychiatric diagnosis†	
Psychotic disorder	12 (44)
Schizophrenia	10 (37)
Psychotic disorder not otherwise specified	2 (7)
Mood disorder	13 (48)
Depressive disorder, without psychotic features	3 (11)
Depressive disorder, with psychotic features	3 (11)
Bipolar disorder	7 (26)
Alcohol and substance abuse	3 (11)
Mental retardation/autistic disorder	2 (8)
Somatic comorbidity†	13 (48)
Cardiovascular	2 (7)
Neurological, including related to catatonia (n = 4)	10 (37)
Any abnormality at cerebral CT/MRI‡	8 (33)
Infectious disease	3 (11)
Catatonia characteristics	
Presence of autonomic dysfunction†	15 (56)
Hyperthermia (≥38°C)	9 (33)
Highest temperature,§ mean (SD), range, °C	37.8 (1.1), 36–40
Cardiac arrhythmia‖	9 (33)
Hypotension and/or hypertension¶	5 (19)
Excessive transpiration and/or saliva production	13 (48)
CGI-Severity score	
Not, borderline, mildly, or moderately ill	0 (0)
Markedly ill	5 (19)
Severely ill	13 (48)
Extremely ill	9 (33)

*Data are presented in numbers and percentages unless otherwise mentioned.

†More than 1 answer possible.

‡For 3 patients, cerebral CT or MRI was missing, and "any abnormality" was defined as presence of white matter lesions (n = 3), cerebral infarction (n = 1), hematoma (n = 1), or other (n = 3).

§In Fahrenheit, mean (SD), range is 100°F (34), 96.8°F to 104°F.

‖Tachycardia was defined as more than 100 beats per minute and bradycardia as less than 60 beats per minute.

¶Hypotension was defined as a systolic blood pressure of 90 mm Hg or less and hypertension as a systolic blood pressure of 140 mm Hg or more.

SD indicates standard deviation; CT, computed tomography; MRI, magnetic resonance imaging.

RESULTS

Patient Characteristics

Table 1 presents the demographic and clinical characteristics of all patients with catatonia who were treated with ECT. In 15 patients (56%), autonomic dysregulation was present. At baseline, one third (n = 9) of the patients were scored on the CGI-S as "extremely ill," almost half (n = 13) as "severely ill," and the remainder (n = 5 [19%]) as "markedly ill."

Treatment Characteristics

The treatment characteristics of the patients with catatonia are summarized in Table 2. Treatment started on average within 18 (40) days after onset of the first symptoms of catatonia. Nineteen patients (70%) were initially treated with benzodiazepines. Mean time interval before ECT was 62 (97) days after onset of catatonia. Bifrontotemporally electrode placement (93%) was almost exclusively used, and a mean of 15 (10) ECT sessions was given. During the first week of treatment, daily ECT was given to 15 (56%) of the 27 patients. After 2 weeks, 15 (56%) patients still received ECT (of which 4 daily), and in 12 (44%) patients, ECT had been discontinued.

All patients were treated with a constant current (0.9 mA) and brief pulse (0.5–1 millisecond) ECT device (Thymatron DgX and later Thymatron IV, Somatics Inc, Lake Bluff, Ill). Mean administered electrical stimulus at the first ECT session was 214 (113) millicoulombs, mean motor seizure duration (as measured with the cuff method at the nonparalyzed limb) was 49 (35) seconds, and mean EEG seizure activity was 68 (47) seconds. Because of lack of seizure adequacy, at the first ECT session, restimulation was required to 9 (39%) patients. At the final ECT session, mean administered electrical stimulus was 471 (241) millicoulombs, mean motor seizure duration was 33 (24) seconds, and mean EEG seizure duration was 47 (31) seconds.

Differences Between Improved and Nonimproved Patients

As assessed with the CGI-I, 16 (59%) of the 27 patients improved, of whom 11 (41%) showed very much and 5 (19%) much improvement. Ten (37%) patients showed no change, and 1 (4%) patient scored very much worse on the CGI-I. In the year after ECT, 14 (58%) patients experienced morbidities (cognitive dysfunction [n = 7], cardiovascular [n = 3], neurological [n = 3], infectious [n = 2], and other [n = 5]), and 3 (12%) patients died of pneumonia, of whom 2 after ineffective ECT.

Table 3 shows the significant differences between the patients who improved (n = 16) and those who did not (n = 11). Improvement was significantly related with younger age ($P = 0.05$), presence of autonomic dysregulation at baseline ($P = 0.02$), especially higher body temperature ($P = 0.02$), daily ECT during the first treatment week (n = 15 [56%]; $P = 0.03$), longer duration of motor and EEG seizure activity at the final ECT session ($P = 0.03$ and $P = 0.04$, respectively), and less morbidity in the year after ECT ($P = 0.03$).

DISCUSSION

Retrospective evaluation of the 27 patients with catatonia who were treated with ECT revealed that more than 50% of the patients recovered completely. Improved patients were younger and more often showed autonomic dysregulation at baseline. Especially increased highest body temperature was correlated with a better outcome. Electroconvulsive therapy was mostly started after unsuccessful treatment with benzodiazepines, mainly within 2 to 3 months after onset of catatonia. The patients were treated with a mean of 15 ECT sessions (mostly administered

TABLE 2. Treatment Characteristics of the Study Population (n = 27)*

Pretreatment			
Benzodiazepines	19 (70)		
Lorazepam (in milligram) at first treatment per 24 h, mean (SD), range, mg	6.3 (5), 1–20		
Bromocriptine, amantadine, or other drug	4 (15)		
Time interval before catatonia treatment,† d			
Before any treatment other than ECT (n = 22)	17.9 (40.3), 1–175		
Before ECT (n = 24)	62.1 (96.6), 3–386		
Characteristics of ECT,‡ mean (SD)			
Electrode placement			
Bifrontotemporal	25 (93)		
Unilateral according to d'Elia	1 (3)		
Not described	1 (3)		
Dosage method at first ECT session			
Half-age method	11 (41)		
Fixed high-dose method	10 (37)		
Empirical titration method	2 (7)		
Age-based method in unilateral ECT	1 (4)		
Not described	3 (11)		
Restimulation necessary at first session (n = 23)	9 (39)		
Total ECT sessions (n = 25)†	14.6 (10.3), 1–34		
Frequency of ECT sessions, mean (SD)	First week	Second week	Third week
Daily	15 (56)	7 (39)	4 (27)
1-d interval	2 (7)	4 (22)	1 (7)
2-d interval	4 (15)	1 (6)	2 (13)
Otherwise	6 (22)	6 (33)	8 (53)
	First ECT session (n = 22)	Last ECT session (n = 21)	
Electrical dose,† millicoulombs	214 (113), 50–504	471 (241), 101–1008	
Seizure activity, s			
Motor seizure activity (cuff method)	49 (35), 24–64	33 (24), 15–49	
EEG seizure activity	68 (47), 37–97	47 (31), 22–72	
Postictal suppression index, %†	81 (29), 0–98§	72 (32), 0–97‖	

*Data are presented in numbers and percentages and n = 27 unless otherwise mentioned.

†Mean (SD), range.

‡Constant current (0.9 mA) and brief pulse (pulse width, 0.5–1 millisecond) device.

§n = 14.

‖n = 15.

bifrontotemporally) and, in the first week of treatment, mostly provided daily. Improved patients had a longer duration of seizure activity at the final ECT session and showed less morbidity in the year after ECT.

The finding that 59% of our patients with catatonia benefited from treatment with ECT is not in line with 3 other studies showing higher effectiveness of ECT in 47 (85%) of 55 patients,[6] 7 (88%) of 8 patients,[7] and 26 (93%) of 28 patients[8] with catatonia. However, these latter studies differed from ours in that their patients were more often women[8] and more often with a diagnosis of a primary mood disorder.[6–8] Comparable with our study, others have reported successful ECT after failure of benzodiazepine treatment of catatonia, with all patients nonresponsive to benzodiazepines (4 of 28 patients[9] and 9 of 18 patients[10]) responding to ECT within 1 week. Because our patients were treated with ECT after a mean time interval of 2 months, treatment delay may have negatively influenced treatment response in our group. Another retrospective study also reported that patients with catatonia who had been exposed to antipsychotics before ECT seemed less responsive to ECT.[6] In the present study, 40% (n = 12) of the patients experienced a primary psychotic disorder and 32% (n = 9) had used antipsychotics just before ECT, which may have resulted in decreased effectiveness compared with other studies. Furthermore, 32% (n = 9) of our patients with catatonia experienced neurological comorbidity; these patients may be less responsive to ECT than other forms of catatonia.[11]

In addition, our data indicate a physician-related delay of at least 2 months before starting ECT for catatonia. Although the mean time interval before ECT among the improved patients was much less than that among the nonimproved group, this difference did not reach statistical significance. The results also show that, particularly, patients with autonomic dysregulation may benefit from ECT. These findings emphasize the importance of prompt, accurate diagnosis and treatment of catatonia. Moreover, particularly in the case of autonomic dysregulation, ECT should be

TABLE 3. Differences Between Improved and Nonimproved Patients According to the CGI-I

	Improved, n = 16	Nonimproved, n = 11	*P*
Age, mean (SD), yr	43 (18)	58 (18)	0.05†
Autonomic dysfunction present, mean (SD)	12 (75)	3 (27)	0.02‡
Highest body temperature during catatonia, mean (SD), °C	38.2 (1.1)	37.2 (0.8)	0.02§
Any abnormality cerebral CT/MRI,* mean (SD)	5 (31)	3 (27)	ns‖
Mean time interval before ECT, mean (SD), d	31 (33.3)	105.7 (136.4)	ns
ECT frequency in first week, mean (SD)			
Daily	10 (63)	5 (45)	0.03¶
1-d interval	2 (13)	0 (0)	
2-d interval	3 (19)	1 (9)	
Other	0 (0)	5 (45)	
Duration seizure activity at last ECT session, mean (SD), ms			
Motor seizure activity	43 (22)	20 (22)	0.03#
EEG seizure activity	61 (28)	33 (28)	0.04**
Morbidity in year after ECT present, mean (SD)	5 (36)	9 (64)	0.03††
Patients who died in year after ECT, mean (SD)	0 (0)	3 (27)	0.06‡‡

Clinical Global Impression–Improvement consisting of 7 items ranging from very much improved to very much worse; data are presented in numbers and percentages unless otherwise mentioned.

*For 3 patients, cerebral CT or MRI was missing.

†$t = -2.078$; $df = 21.283$.

‡Fisher exact test, 6.014; $df = 1$.

§$t = 2.620$; $df = 22.840$.

‖Not significant.

¶χ^2, 9.271; $df = 3$.

#$t = 2.370$; $df = 17.127$.

**$t = 2.252$; $df = 18.000$.

††χ^2, 7.059; $df = 2$.

‡‡Fisher exact test, 2.536; $df = 1$.

considered as first-line treatment. Although our nonimproved patients were older, ECT remains an important treatment option because some of our older patients with severe catatonia recovered completely.

Our finding that the improved patients had more often received daily ECT sessions in the first week may be clinically relevant. In practice guidelines,[12] no explicit advice is given about the frequency of ECT in severely ill patients. Although the risk of cognitive adverse effects is reported in higher ECT frequency,[13] these adverse effects must be balanced against the risks of morbidity and mortality due to catatonia. Therefore, we believe that good clinical practice entails that, initially, daily ECT should be given for severely ill patients until remission of autonomic dysfunctions.

Although not statistically different from the improved patients, the nonimproved patients were treated with a lower total mean number of ECT sessions. It is therefore possible that the nonimproved patients were treated less persistently with ECT. The finding that longer duration of seizure activity at the final ECT session seemed to be related to better outcome was in line with our clinical impression that in several patients, seizure adequacy improved simultaneously with the clinical condition of the patient during the ECT course (eg, lower electrical dosage needed to elicit longer seizure activity, more adequate seizure expression on EEG, and higher postictal suppression index). This leads to several interesting questions, for example, how do seizure characteristics predict the effectiveness of ECT in catatonia, and is there any influence of the natural course of catatonia on brain activity and seizure threshold? Although hard to realize in clinical practice, prospective examination of this clinical impression may help to further elucidate catatonia and its underlying cerebral dysfunctions.

The retrospective design of our study does not allow to draw firm conclusions. In addition, the diagnoses were made without using standard diagnostic instruments or catatonia rating scales; however, they were made by experienced psychiatrists with all relevant information at their disposal. Furthermore, the clinical outcome was standardized using the CGI-I. Because patients with catatonia are infrequently seen in clinical practice, retrospective studies may be valuable in allowing to share practice-based knowledge on the treatment of catatonia.

In conclusion, in the present study, ECT was mostly an effective treatment option for catatonia, especially in younger patients with autonomic dysregulation. Daily administration of ECT in the first treatment week seemed to be more effective for catatonia. Treatment procedures were comparable with those in patients with more common indications for ECT, and longer duration of seizure activity at the final ECT session was related to better outcome. In the present study, the physician's delay in starting ECT indicates the importance of prompt, accurate diagnosis and treatment.

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