

# Electroconvulsive therapy for treating schizophrenia: a chart review of patients from two catchment areas

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**Abstract** To examine disease and treatment characteristics of patients with schizophrenia treated with electroconvulsive therapy (ECT). We examined charts from 79 patients diagnosed with schizophrenia ( $n = 55$ ), persistent delusional disorders ( $n = 7$ ), and schizoaffective disorders ( $n = 17$ ) between 2003 and 2008. We recorded age, sex, indication for ECT, number of ECT sessions, ECT series, outcome, maintenance ECT, use of antipsychotics, duration of illness, and duration of the current exacerbation. All patients were taking antipsychotics at the time of enrolment in the study. Acute ECT included 2–26 sessions; maintenance ECT (M-ECT) was given to 18 patients for up to 12 years. Initial indications for ECT included psychosis ( $n = 28$ ), pronounced affective symptoms ( $n = 28$ ), delirious states ( $n = 20$ ), and M-ECT ( $n = 3$ ). Most patients experienced excellent/good outcomes ( $n = 66$ ), but others experienced moderate ( $n = 8$ ) or poor ( $n = 5$ ) outcomes. No factors were identified that predicted treatment responses in individual patients. ECT proved to be effective in a population of patients that were severely ill with treatment-refractory schizophrenia. This does not imply that the patients were cured from schizophrenia. Rather, it reflects the degree of relief from psychosis and disruptive behaviour,

as described in the patient charts. The treatment was often offered to patients after considerable disease durations.

**Keywords** Schizophrenia · Electroconvulsive therapy · Clozapine · Maintenance ECT · Persistent delusional disorder

## Introduction

Electroconvulsive therapy (ECT) is used to treat severe mental disorders. The first successful ECT treatment course was reported in 1938 [1]. Since then, ECT has been considered a treatment option for schizophrenia. ECT treatment was used extensively throughout the 1940s and 1950s for a variety of psychiatric disorders. When antipsychotic medication was introduced in the 1950s, ECT treatments for schizophrenia declined, and today most ECT studies are conducted on patients with affective disorders [2].

Studies have shown that approximately 50% of schizophrenic patients responded to common antipsychotic medications [3] and a further 25% responded to treatment with clozapine [4]. However, about 25% of patients with psychosis are classified as treatment refractory [4, 5].

Extensive research on the use of ECT for schizophrenic disorders was primarily performed in the 1940s and 1950s. Compared to those times, the diagnostic criteria for schizophrenia have become more restrictive, and the catatonic subtype of schizophrenia is diagnosed less frequently. In addition, the dosing and administration of ECT have changed. Therefore, it is not possible to extrapolate directly from early clinical trial results to current results. Moreover, patients with schizophrenia that are currently treated with ECT have had more severe illnesses, have had a longer illness durations, and have been through more

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treatment attempts than patients treated with ECT in earlier studies [6]. Recent studies have found that ECT is efficacious on different symptoms, for example, psychotic core symptoms, affective symptoms, and suicidality [7–9].

A Cochrane review from 2006 concluded that “ECT, combined with antipsychotics, may be an option for schizophrenic patients, particularly when rapid global improvement and reduction in symptoms is desired. This also goes for the treatment-refractory patients” [10].

Various national guidelines on the indications for ECT are quite restrictive; however, they do suggest the use of ECT in special circumstances [11–13]. The American Psychiatric Association concluded that “ECT is effective for psychotic exacerbations in schizophrenic patients, when illness is of the catatonic type, when the psychotic symptoms were abrupt or recent in onset, or when there is a past history of favourable response to ECT”. Also, “ECT is effective for psychotic disorders related to schizophrenia, that is, schizophreniform disorders and schizoaffective disorders” [11]. These criteria are likely to generate substantial variability in the frequency of ECT use between different countries and clinics. In addition, the efficiency of ECT might vary with different schizophrenic subpopulations. Few reports have described the frequency of ECT use, the nature of the symptoms, and the outcome of treatment. Therefore, we made a chart review analysing all patients diagnosed with schizophrenic spectrum disorders that received ECT treatment within a 6-year period. The patients had been admitted to one of two university hospitals covering two catchment areas in the greater Copenhagen area. To curb the problem of differential diagnostic uncertainty, we included patients with schizophrenia, persistent delusional disorders, and schizoaffective disorders.

#### Aims of the study

- To characterise the use and effectiveness of ECT in patients with schizophrenic spectrum disorders in two catchment areas of Copenhagen over a 6-year period.
- To describe the effects of ECT in three distinct diagnostic subgroups.
- To determine whether symptomatology could predict individual treatment response.
- To describe the effect of ECT in patients concurrently using clozapine.

#### Materials and methods

The study was conducted at the University Hospitals of Glostrup and Rigshospitalet, both located in the greater Copenhagen area. Their catchment areas consisted of

approximately 250,000 and 110,000 inhabitants, respectively. During the 6-year study period, a total of 377 and 221 patients received ECT in Glostrup and Rigshospitalet, respectively. Of these, 59 and 20, respectively, were diagnosed with schizophrenia spectrum disorders (F2) according to the International Classification of Diseases, v.10 (ICD-10).

The diagnoses of patients that received ECT from January 1, 2003 to December 31, 2008 were identified through the hospital registration system that submitted the diagnoses to the Danish Psychiatric Central Register [14]. Medical records of patients were retrieved and included in this study when classified within three ICD-10 diagnostic categories: schizophrenia spectrum disorders (F20.0–F20.9), persistent delusional disorders (F22.9), and schizoaffective disorders (F25.0–F25.9).

The first ECT treatment registered for each patient admitted during this 6-year period was defined as the index treatment. The following data were obtained for each patient: sex, age, diagnosis, duration of psychiatric disorder, previous ECT treatments, indication for index ECT treatment, duration of current exacerbation, medical treatment administered before prescription of ECT, concurrent medical treatment, outcome of ECT treatment, subsequent prescription of maintenance ECT, detailed symptomatology, and ECT treatment details.

#### Diagnoses

During admission, patients were routinely diagnosed according to the diagnostic criteria outlined in ICD-10. This population did not receive routine use of diagnostic instruments, including the Present State Examination or SCAN. However, most of the included patients had a long disease duration; thus, the diagnosis was considered relatively reliable. During the data collection period, five patients underwent diagnosis change. One patient was changed from paranoid schizophrenia (F20.0) to mental retardation (F70), two patients were changed from emotionally unstable personality disorder (F60.31) to paranoid schizophrenia (F20.0), and two patients were changed from bipolar disorder (F33.x) to schizoaffective disorder (F25.x). After discussion among the authors, we decided to exclude only the patient with the F70 diagnosis and included the other four patients. No patients underwent further diagnostic changes throughout the study period.

#### Patient classifications

All patients were hospitalised due to an exacerbation of their schizophreniform disorder. Duration of the current exacerbation varied; however, all patients had been hospitalised for at least 1 week, before ECT treatment was

commenced. The indication for ECT was the increase in acute episodes or increase in the symptom severity leading to hospitalisation. All patients were psychotic, fulfilling the diagnostic criteria for their respective disease entity. Since treatment with psychotropics appeared insufficient, ECT treatment was initiated.

To distinguish between treatment responses and to identify outcome predictors, the patient population was first subdivided into the three diagnostic categories: (1) F20.0–F20.9, (2) F22.9, and (3) F25.0–F25.9.

Indication for ECT treatment was then grouped in five mutually exclusive categories, based on the most prominent symptomatology as described by the treating physicians in the patient charts. Three patients had been in active treatment with maintenance ECT (M-ECT) for several years before the study period. They are registered in their own group as M-ECT patients.

1. Affective symptoms, primarily depressive symptoms, but also mixed states from the F25 segment.
2. Psychotic symptoms (e.g. hallucinations, delusions, anxiety).
3. Assaultive behaviour due to psychosis.
4. Delirious state (e.g. severe sleep disturbances, severe agitation, refusing food and liquids).
5. Maintenance ECT.

## Outcome

Since the charts did not contain any standardised assessments of severity of illness or degree of improvement as for example employed by Nothdurfer et al. [15], assessment of outcome was carried out by the authors. The chosen categories do correspond fairly well with the Item 3.1 from the CGI: Very much improved, Much improved, Minimally improved, No change [16]. Each patient chart was then assessed, based on the wording in the patient chart and placed in one of four categories.

1. Excellent: The patient chart clearly stated that the patient had profited dramatically from the ECT treatment. For example, it was described that the patient became free of prominent psychotic symptoms and, e.g., moved from the secure ward to an open ward facility or discharged within a few days.
2. Good: the patient regained many of their previous abilities and required only minor further stabilisations, and hospitalisations was usually terminated within 1–2 weeks.
3. Moderate: treatment had some effect on psychotic symptoms, but quite significant treatment resources had to be applied, and hospitalisation continued for a longer time period.

4. Poor/none: treatment had no effect on the patient, as assessed by the treating physician.

## ECT-technique

The ECT procedures followed Danish recommendations [12], were identical at the two psychiatric hospitals, and remained unchanged during the entire study period. Seizures were induced with a Thymatron system IV (Somatrics, inc. Lake Bluff III). The 2 × dose programme was used. The stimulus dose was chosen with a formula-based method that considered age, sex, and choice of treatment. Routinely, electrodes were placed in a bifrontotemporal (BL) position. When memory impairment became prominent, electrodes were placed in the right unilateral (RUL) position. Further detailing of the technical ECT procedures including detailed description of the anaesthesia procedures is described in the work by Bauer et al. [17]. In total, only two patients received RUL treatment, due to both advanced age and emerging cognitive impairment. When a patient was treated for a delirious state, treatment was initially given daily on three consecutive days.

## Coercion

According to Danish legislation, ECT can only be applied involuntarily if the life of the patient is in actual or potential danger (e.g. malignant catatonia or psychogenic delirium.). This is in contrast with the code of practice for coercive treatment in general, where the necessary preconditions are either danger to the patient's life or the prospect of a decisive improvement of the patient's condition (mental health act 01.11.2006). Physical restraint in the form of a leather belt or more rarely leather bracelets was used on several of these patients.

## Results

A total of 79 patients were identified (32 men, 47 women). Clinical and demographic characteristics of the sample are shown in Table 1. All patients were taking antipsychotic medications. Some patients were also taking antidepressants and/or mood stabilizers. The distribution of the drugs used among the three diagnostic categories is shown in Table 2. The characteristics of the ECT treatments of the sample are summarised in Table 3. The outcomes of acute ECT treatment in the three diagnostic groups were classified by the indication for ECT (Table 4).

The schizophrenic group (F20) was the largest, with 55 patients (25 men and 30 women). The majority was diagnosed with paranoid schizophrenia (F20.0;  $n = 44$ ), but

**Table 1** Patient characteristics among three ICD-10 diagnostic categories: schizophrenia (F20.x), persistent delusional disorders (F22.x), and schizoaffective disorders (F25.x)

Diagnosis	F20.x	F25.x	F22.x
Males	25	6	0
Females	30	11	7
Age (mean, years)	47	53	65
Duration of disease (mean, years)	19	21	6
Duration of current exacerbation (mean, months)	5	4	2

**Table 2** The differential distribution of drug use among the three diagnostic categories

Drug	Antipsychotics	Antidepressants	Mood stabilisers	Clozapine
F20.x ( <i>n</i> = 55)	55 (2.5)	20	9	15
F25.x ( <i>n</i> = 17)	17 (2.3)	6	4	5
F22.x ( <i>n</i> = 7)	7 (2.1)	5	2	–

All patients were taking antipsychotics—many patients were taking several types of antipsychotics (mean number/patient in parenthesis). ICD-10 diagnostic categories: schizophrenia (F20.x), persistent delusional disorders (F22.x), and schizoaffective disorders (F25.x)

some were diagnosed with other types of schizophrenia, including: hebephrenic (F20.1; *n* = 1), catatonic (F20.2; *n* = 1), undifferentiated (F20.3; *n* = 4), simple (F20.6; *n* = 2), and unspecified (F20.9; *n* = 3). No patients were diagnosed with postschizophrenic depression (F20.4). Across the indications, ECT showed excellent or good treatment response in 43 of 55 patients. The patients (age 18–79 years) had disease durations from 1 to 40 years. Before the ECT treatment was initiated, some patients had been continuously psychotic for over 5 years, and others had only experienced a psychotic exacerbation for one to 2 weeks. Thirteen patients received M-ECT; of those, two received only M-ECT throughout the study period. Eleven patients received more than one ECT treatment course.

Seven patients required physical restraints, and three patients were treated with ECT under coercion. One patient developed neuroleptic malignant syndrome during hospitalisation was then taken off antipsychotics and treated with ECT. Eight patients exhibited psychotic relapse after successful ECT. The relapse latency after an effective ECT series varied from ten days to a few months. Five of the eight patients with relapses received a subsequent ECT treatment, with satisfactory results.

The schizoaffective group (F25) consisted of 17 patients (6 men and 11 women). Across the indications, ECT showed excellent or good treatment response for all these patients. The patients (age 36–71 years) had disease durations of 5–35 years, and the duration of the current

**Table 4** Outcome of acute ECT, based on diagnosis (bold) and indication for ECT. ICD-10 diagnostic categories: schizophrenia (F20.x), persistent delusional disorders (F22.x), and schizoaffective disorders (F25.x)

Outcome ⇒ Diagnosis, indication	Excellent	Good	Moderate	Poor
<b>F20.x (<i>n</i> = 55)</b>	<b>28</b>	<b>15</b>	<b>8</b>	<b>4</b>
Affective ( <i>n</i> = 15)	5	3	5	2
Psychosis ( <i>n</i> = 19)	9	7	2	1
Assaultive ( <i>n</i> = 4)	2	–	1	1
Delirium ( <i>n</i> = 15)	10	5	–	–
M-ECT ( <i>n</i> = 2)	2	–	–	–
<b>F25.x (<i>n</i> = 17)</b>	<b>13</b>	<b>4</b>	–	–
Affective ( <i>n</i> = 9)	7	2	–	–
Psychosis ( <i>n</i> = 1)	1	–	–	–
Assaultive ( <i>n</i> = 2)	1	1	–	–
Delirium ( <i>n</i> = 4)	3	1	–	–
M-ECT ( <i>n</i> = 1)	1	–	–	–
<b>F22.x (<i>n</i> = 7)</b>	<b>3</b>	<b>3</b>	–	<b>1</b>
Affective ( <i>n</i> = 4)	1	3	–	–
Psychosis ( <i>n</i> = 2)	1	–	–	1
Assaultive ( <i>n</i> = 0)	–	–	–	–
Delirium ( <i>n</i> = 1)	1	–	–	–
M-ECT ( <i>n</i> = 0)	–	–	–	–

M-ECT maintenance ECT

**Table 3** Summary characteristics of the ECT treatment in the three diagnostic groups and in two subsamples

	Min. number of ECT sessions	Max. number of ECT sessions (acute)	Mean number of ECT sessions	More than one ECT series (number of patients)	Maintenance ECT (number of patients)
F20.x ( <i>n</i> = 55)	2	26	10	11	13
F25.x ( <i>n</i> = 17)	3	25	8	3	5
F22.x ( <i>n</i> = 7)	4	12	7	3	–
Cloz ( <i>n</i> = 20)	2	24	10	4	7
Poor ( <i>n</i> = 5)	7	14	11	1	–

ICD-10 diagnostic categories: schizophrenia (F20.x), persistent delusional disorders (F22.x), and schizoaffective disorders (F25.x)

Two subsamples: clozapine treated (Cloz) and poor responders (Poor)

exacerbation had lasted from 2 weeks to 4 years. Four patients received M-ECT. Of those, one received only M-ECT throughout the study period. Three patients required physical restraints, and one was treated with ECT under coercion. Six patients received more than one ECT treatment course; of these, one was finally switched to M-ECT treatment.

The persistent delusional disorders (F22) group consisted of 7 patients (all women). Six of the seven patients showed an excellent or good response. The patients in this group (age 43–82 years) were older than the patients in the other two groups. The mean duration of the current exacerbation was 2 months. One patient received two ECT treatment courses during the inclusion period; two other patients had tried ECT treatment before inclusion into this study. None received M-ECT treatment.

For detailed analyses, another division of the patients was made: patients treated with M-ECT, patients treated with clozapine, and patients with poor treatment response. All were patients also included in one of the categories listed above.

Eighteen patients were treated with M-ECT (13 with schizophrenia and 5 with schizoaffective disorder; 6 men and 12 women; mean age 45, range 26–58 years; mean disease duration 21, range 5–35 years). The initial indications for ECT were psychosis ( $n = 7$ ), affective symptoms ( $n = 6$ ), delirious state ( $n = 1$ ), and assaultive behaviour ( $n = 1$ ). Six patients were treated with more than one acute ECT treatment course before commencing with M-ECT. Sixteen patients showed an excellent or good response, and two patients showed a moderate response. The duration of the ECT treatment varied between 3 months and 12 years (mean: 2.2 years). The frequency of treatment varied between once weekly and once every third week; but most treatment intervals were 2 or 3 weeks. All patients treated with M-ECT also received 1–5 types of antipsychotics (mean: 2.7 types/patient). Currently, of the 18 patients, 11 have continued with active M-ECT treatment.

Twenty patients (10 men and 10 women) were taking clozapine during the index ECT treatment. Six other patients started taking clozapine later in the study period. Fifteen patients were taking clozapine for schizophrenia and five for schizoaffective disorder. The disease duration was 3–40 years (mean 23 years). The duration of the current exacerbation was 2 weeks to 3 years (mean 6 months). Six patients required physical restraints, and two were treated with ECT under coercion. The indications for ECT were psychosis ( $n = 7$ ), pronounced affective symptoms ( $n = 3$ ), delirious state ( $n = 6$ ), and assaultive behaviour ( $n = 3$ ). One patient received only M-ECT throughout the study. Eighteen patients showed an excellent or good response.

Five patients (2 men, 3 women; mean age 44, range 18–60 years) were classified as poor responders. Four were

diagnosed with F20.x, and one was diagnosed with F22.9. The disease duration was 1–40 years, and the mean duration of the current exacerbation was 11 months (range, 2–36 months). Patients used 1–3 types of antipsychotics (mean 2.4 types/patient). The indications for ECT included: affective symptoms ( $n = 2$ ) and psychosis including assaultive behaviour ( $n = 3$ ). The ECT treatment courses lasted 7 to 14 sessions.

There were no reports of prolonged or spontaneous seizures and no episodes of treatment-emergent arrhythmias or respiratory/cardiac arrest. As of September 2009, 2 patients died (both after extensive alcohol abuse) and 6 moved out of the catchment areas and were lost to follow-up.

## Discussion

This study investigated the use of ECT for schizophrenia, schizoaffective, and persistent delusional disorders in two hospitals with defined catchment areas in the greater Copenhagen area. This population most likely included all the cases that required the use of ECT in this area, because no private clinics offered the treatment and because patients with schizophrenia in Denmark rarely seek ECT in hospitals outside their local catchment areas. Assuming a 1% prevalence of schizophrenia [18], our data showed that 1.5% of patients with schizophrenia received ECT over the 6-year period.

All patients received treatment with conventional and atypical antipsychotic medications throughout the study period. A minority was also treated with antidepressants or mood stabilizers. The population was aged, and most had suffered from schizophrenia for many years. Despite the pharmacological treatment, all patients were hospitalised during the study period, due to exacerbation of the psychosis. Some had experienced severe depressive symptoms, including suicidal ideations; others were delirious, still others were tormented by psychotic hallucinations and delusions. A minority were psychotically assaultive and violent.

The common denominator of the population was that hospitalisation and increased pharmacological treatment were insufficient for treating the exacerbation. Thus, treatment with ECT was the last resort. All except 5 of the patients experienced relief with ECT. Of the 79 patients, 66 (84%) showed excellent or good treatment responses.

The duration of the acute psychotic exacerbation did not appear to be a determining factor in predicting treatment response. Furthermore, the disease duration did not appear to be an issue. Some patients had been diagnosed with schizophrenia for over 30 years, yet benefited from an ECT treatment course. An excellent response did not imply that



the patient was cured from schizophrenia. Rather, it reflected the degree of relief from psychosis and disruptive behaviour, as described in the patient charts.

Many published studies have compared ECT with pharmacological treatments. Currently, the consensus is that ECT should be considered an adjunctive treatment to pharmacological treatment [5, 9–11, 19]. However, not all studies demonstrated significant treatment advances, when adding ECT to antipsychotic treatment in a treatment-refractory population of schizophrenics [20]. In our study, all patients were treated with antipsychotics. Most were treated with second-generation antipsychotics, but some were treated with zuclopenthixol, haloperidol, or perphenazine. Polypharmacy was quite common in this population.

Twenty patients were taking clozapine at the time of the index ECT episode. Further six patients were started on clozapine later in the study period, when a new round of acute ECT was given (data not shown). A previous prospective study found response rates of 72% to ECT; they concluded that ECT could be used as adjunctive treatment in clozapine-refractory patients [5]. Another review concluded that “evidence exists for the safety and short-term efficacy of the concurrent administration of clozapine and ECT” [21]. In this population, it appeared that the combination of ECT and clozapine was safe and well tolerated.

This study included a wide variety of patients. Some patients were newly diagnosed and others had experienced very long disease duration. Patient age varied from 18 to 82 years. The duration of the current exacerbation (that led to ECT treatment) also varied considerably, from 2-week duration for patients with psychotic delirium, to more than 7 years for some patients with chronic schizophrenia.

Some previous studies found that short duration of illness appeared predictive of more positive outcome [9]. Other studies concluded that the duration of the current exacerbation was the more critical parameter for determining treatment response [8, 22]. Advanced age (>60 years) has also been identified as a predictor for positive outcome [23]. In this study, most patients had long disease duration, yet experienced a positive outcome. Advanced age could not be used as a predictor for good outcome because the subsample was too small to draw any conclusions on that matter.

The indication for ECT was based on the chart descriptions of the most prominent symptoms. Over one third (35%) of the patients received ECT treatments due to pronounced mood symptoms and 28% due to psychotic symptoms. The efficiency of ECT on mood symptoms and delirious states in the schizophrenic and schizoaffective groups is consistent with other studies that suggested ECT has a general mood-stabilising effect [24].

Although psychotic symptoms, like delusions and hallucinations, are not common indications for ECT, several studies found that positive psychotic symptoms were predictors of positive treatment response [8, 9, 21, 22, 25]. Some studies found that ECT improved positive symptoms, but not negative symptoms [8, 21, 22]. Others found that ECT had equally good effects on positive and negative symptoms [5]. In the present study, the 22 patients who were predominantly psychotic responded well to ECT (Table 4). So did four of the six psychotically assaultive patients. They were described in a separate category because they constitute special challenge in treatment, care, and medico-legally. They were often restrained for weeks before ECT treatment, and they were all placed in high-security closed wards. They all volunteered to ECT treatment. The result is in line with the finding [22] that ECT has good effect on the hostility item on the BPRS. Also, a small study from USA [26] describes six treatment-refractory schizophrenic patients, who court ordered to ECT treatment showed positive results in 5/6.

We could not elaborate on the responsiveness of negative symptoms to ECT treatment in this study, because negative symptoms were not well described in the charts of these highly symptomatic patients.

Catatonia is both a specific diagnostic disease (F20.2) and a symptom observed in other psychiatric and medical diseases. ECT has been shown to be particularly effective as a treatment for patients with catatonia. In this sample, only one patient was diagnosed with F20.2 (catatonic schizophrenia), and a few of the severely agitated patients exhibited catatonic behaviour. The reasons for low frequency are not clear. The syndrome is probably more rare today than earlier [6] and in ICD10 F20.0 takes precedence over F20.2 even if the patient has catatonic features that if not prominent might be overlooked. Another explanation is that the ongoing treatment with antipsychotic medication prevented the development of catatonic symptoms. In accordance with the literature [13, 21], all responded well to ECT.

The category, delirium, was included since psychogenic delirium [27] or as it is often called in the American tradition, malignant catatonia, is an indication for ECT [28]. As described in the literature, somatic causes like urinary tract infection, withdrawal symptoms, pneumonia etc., was ruled out. The cause of delirium was therefore probably not an underlying somatic condition.

Eighteen patients received M-ECT treatment. The interval between treatments was based on individual treatment responses, but the majority received treatment every second or third week. Longer time intervals between sessions did not occur. Currently, eleven of these patients continue to receive M-ECT. One patient has been treated for 12 years. All these patients live outside the hospital,

most in specialised nursing homes, and some are employed. All had been severely ill for many years before starting ECT treatment; currently, they are capable of living a fairly normal life. A minority have received more than 80 ECT sessions, with a maximum of over 125 sessions. No patients have reported pronounced side effects, including severe memory loss.

Very few studies exist on the use of M-ECT [29–32]. However, it was clear that the treatment was beneficial for a subgroup of patients that did not sufficiently respond to other treatments. It has been well established that the treatment is well tolerated in middle-aged groups [31]. There is no consensus on the optimal treatment interval, or when the treatment should be terminated. A retrospective study from France suggested that treatment algorithms could not be used [33]. Instead, decisions had to be based on individual patient response, depending on the clinical symptoms, compliance, and tolerance to ECT. Based on the present study, we concluded that M-ECT is an effective adjunctive treatment in a subgroup of patients that may otherwise be perpetually hospitalised and heavily medicated.

The seven patients with persistent delusional disorder were all women, were significantly older, and had a shorter duration of illness as well of the current exacerbation. Although the gender distribution for patients with this diagnosis generally is 1:1, females become ill significantly later than males and more men changed diagnosis to schizophreniform disorders [34]. This could at least partly explain the age and sex distribution in the present study. Three of the seven women had received more than one treatment course with ECT. Treatment with ETC did show good effect on their psychotic conditions.

Since the patient's condition was not systematically assessed during the treatment, the classification of the effect of the treatment response had to be worked out retrospectively from the wordings of the treating physicians in the charts. This way, evaluation of improvement may be overestimated. Some of the pitfalls here were that the final outcome was known, when assessment of the severity and improvement of the illness were made. Also, focus during data collection was on the part of the illness, which improved, and finally, the authors may be biased in favour of ECT treatment. It is not possible, however, to give a numeric value, as to what extent, this has been the case in this study.

In conclusion, ECT administered in this very restricted population appeared to be very efficient as an acute treatment. Together with more recent controlled studies [22], our results raised the question of whether ECT has been underused in treatment-refractory patients with schizophrenia. This should be investigated in future randomised studies of ECT that include monitoring the effects of ECT

on symptoms, quality of life, and side effects in long-term follow-ups.

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