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The efficacy and safety of ECT in population before and after 60 years of age

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Summary

Objectives. The aim of the study was to evaluate efficacy and safety of electroconvulsive therapy (ECT), in two age groups: before and after 60 years of age.

Methods. The study included 107 patients, 62 women and 45 men hospitalized in the Institute of Psychiatry and Neurology and treated with ECT in 2013 and 2014. 76 people were below 60 years; 31 people – above 60. The authors analyzed the course of 1086 ECTs, 747 sessions for patients before 60 and 339 in patients over 60 years of age. The efficacy of ECT was diagnosed using CGI Scale.

Results. No serious complications such as death, life-threatening condition, hospitalization in another ward or permanent injury occurred. In 67.11% of patients below 60 and 42% of patients after 60 years of age no side effects were observed. Below 60 years of age most frequently reported adverse reactions were headaches (13.16% of patients), above 60 years of age – memory impairment (22.58% of respondents). Arrhythmias occurred in 6 patients aged over 60. Disturbances of consciousness occurred among older patients slightly less frequently than in younger patients (3.25% vs. 3.95%). In patients over 60 years of age remission rate was similar as in younger age group (32.89% vs. 32.26%) and significant improvement rate was even higher (61.29% over 60 vs. 48.68 before 60 years of age). No improvement of mental state occurred in 7.89% and worsening occurred in 2.63% of younger patients. All patients aged over 60 years benefited from the treatment.

Conclusions. The effectiveness of ECT in elderly was similar as in younger age group. The tolerance was slightly worse in patients aged over 60 years than in younger patients. The biggest problem in the elderly was not cognitive impairment, but the cardiovascular complications.

Key words: electroconvulsive therapy, depression, treatment effectiveness

The study was not sponsored.

Introduction

The application of electricity to induce a seizure was known in the treatment of mental disorders for over 200 years. The first application of electrical stimulation occurred in 1861 (Klemens Maleszewski), according to generally accepted version in 1938 (Bini and Cerletti) [1, 2]. The spectacular improvement in mental state was reported, but due to the massive side effects and a large number of periprocedural complications for many years the electroconvulsive therapy was seen as highly dangerous and traumatic for the patient. The breakthrough for the development of ECT was the introduction of succinylcholine to relax the striated muscle and execution of ECT under general anesthesia. This procedure proved to be safe and general anesthesia and relaxation using succinylcholine became standard procedure during ECT [1, 3]. Also, the introduction of modern equipment using current with rectangular pulses instead of sinusoidal current, and then ultrabrief pulses, caused reduction of the incidence of somatic and cognitive side effects and increased the effectiveness of the treatment [1].

Indications for ECT are wide [4–9] and include both mental and somatic states in which there is a need for a rapid response (e.g., severe catatonia, acute mania or psychotic depression, depressive stupor, depression with suicidal thoughts and tendencies or malignant neuroleptic syndrome), as well as in drug resistance in the course of affective disorders and psychosis or conditions where the use of pharmacotherapy is riskier than ECT treatment (e.g., depression in pregnancy, mental disorders in patients with other medical conditions, patients with poor tolerance of pharmacotherapy or in case of interactions of psychotropic drugs with drugs ordered due to other diseases).

The risk of life-threatening complications in the course of ECT treatment is now estimated at 1:50 000, wherein the serious complications occur in about 2% of patients [10]. The death associated with ECT occurs one time for 80 thousand of ECT sessions or 1 in every 10 thousand of patients treated with ECT [11].

The only definite contraindication to electroconvulsive therapy is the increase of intracranial pressure [1, 3, 10]. Relative contraindications are, among others, heart attack within the last 3 months, uncompensated heart failure, unstable angina pectoris, complex arrhythmias, aortic aneurysm, uncontrolled diabetes mellitus or renal failure, metabolic disorders, severe lung disease, retinal detachment, stroke within the last 4 weeks, intracranial tumor [1, 3, 10].

Usually the improvement of mental state is observed after at least 6–7 sessions in the course of 10–12 ECT series, it happens, however, that the first ECT procedure brings relief of depressive symptoms. The number of sessions depends on the mental state of the patient and the tolerance of treatment. Sometimes 14–16 sessions are required, or in the case of early remission treatment is reduced to 8–9 sessions.

Currently as an effective ECT session is considered the session, during which the seizure activity lasts at least 30 seconds, but some researchers believe that even ECT with the seizure time more than 15 seconds may cause clinical improvement [3, 10].

It is estimated that the effectiveness of ECT in depression reaches 80–90%. [1] According to a STAR-D study [4] the effectiveness of ECT in drug-resistant depression

is about 50%, and is still higher than the effectiveness of pharmacotherapy. Despite this, electroconvulsive therapy in Poland is still used rarely and is usually considered as a last choice, after having exhausted the possibilities of pharmacological treatment. Particularly the effectiveness and safety of ECT in the population of elderly patients raises many fears and doubts.

The scope of the analysis and the aim of the study

In this article are presented the results of a retrospective study. In the study the medical records (medical history, documentation of ECT procedures, printed reports of Thymatron System IV for each of the ECT, anesthetic documentation) on 107 patients hospitalized in clinical departments of the Institute of Psychiatry and Neurology in Warsaw and undergoing ECT treatment in 2013 and 2014 were analyzed.

The aim of the study was to evaluate the efficacy and safety of electroconvulsive therapy, in two age groups – patients before and after 60 years of age. This study was of naturalistic observation of the patients hospitalized and treated with ECT with a diagnosis of a single episode of depression, depressive episodes in the course of bipolar disorder or recurrent depression, mania in bipolar disorder and schizophrenia.

Qualification for the treatment and the technique for ECT performing

All patients were eligible for ECT treatment by a psychiatrist after internist, neurological, ophthalmological, anesthesiological consultation, in all cases the necessary laboratory tests and imaging and other additional tests ordered by consultants were performed.

In case of one patient, ECT was performed despite the somatic contraindications due to the direct threat to the patient's life.

Treatments were performed using the Somatics Thymatron System IV. All the analyzed sessions were bitemporal. Somatics Thymatron System IV uses electrical pulse characterized by a constant flow 0.9 A; each pulse width is 0.5 ms; the overall electrical charge used to induce seizure activity was variable, and the selection was made in accordance with the manufacturer's instructions taking into account the age of the patient.

All procedures were performed under general anesthesia with the use of muscle relaxants (Institute of Psychiatry and Neurology normally uses atropine, thiopental and succinylcholine; only in case of one patient propofol was used instead of thiopental due to the allergic reaction of the patient).

As the vigilance procedure, ECT is a therapeutic method that requires obtaining separate consent. The granting of consent in each case must be preceded by full medical information concerning the course of the treatment, risks associated with ECT and possible side effects. In the analyzed population all patients except three persons have given their consent in writing for electroconvulsive therapy. In three cases ECT were proceeded due to life-threatening health conditions (not taking food and liquids, cachexia in the course of depression, intense suicidal thoughts, catatonic schizophre-

nia) with the assent of family court without the consent of the patient. In case of three people ECT was discontinued prior to obtaining improvement in mental state, because of the withdrawal of the patient's consent.

Analysis of the study group

In total, over a two-year follow-up period electroconvulsive treatment was performed in 107 patients. 62 females (58%) and 45 males (42%) were enrolled to the ECT treatment. The analyzed population included people aged from 17 to 76 years. 76 patients were in the age below 60 – 46 women and 30 men; in a population above 60 were 31 patients – 16 women and 15 men. The only minor person in the group was 17-year-old patient treated with ECT due to drug-resistant schizophrenia (Table 1).

Table 1. **Structure of the study group**

	Altogether n (percentage)		Patients before 60 years of age n (percentage)		Patients over 60 years of age n (percentage)	
Women	62	58%	46	61%	16	52%
Men	45	42%	30	39%	15	47%

In total, in 2013 and 2014 1,086 ECT procedures were performed, of which 747 sessions in population below 60 and 339 procedures in patients over 60.

The most common diagnosis in a group of patients below 60 was bipolar disorder (42.11%), on the second place among the diagnoses was schizophrenia (39.47% of patients). Among patients with bipolar disorder qualified for ECT dominated patients with severe depression without psychotic symptoms (34.21% of the population before 60 years of age).

Among 107 patients treated with ECT during 2 years of observation none of the patient was diagnosed with schizoaffective disorder (Table 2).

Table 2. **Structure of diagnoses**

Diagnoses in population before and after 60.	Before 60. n (percentage)	Over 60 n (percentage)
BD, severe depression with psychotic symptoms	4 (5.26%)	6(19,35%)
BD, severe depression without psychotic symptoms	26(34,21%)	17(54,84%)
BD, moderate depression	1 (1.32%)	
BD, manic episode	1 (1.32%)	
Recurrent depression, severe depression with psychotic symptoms	3 (3.95%)	4 (12.90%)
Recurrent depression, severe depression without psychotic symptoms	4 (5.26%)	2 (6.45%)
Recurrent depression, moderate depression		
Schizophrenia	30 (39.47%)	1 (3.23%)
Schizoaffective disorder	0	0

table continued on the next page

Severe depression episode with psychotic symptoms	2 (2.63%)	1 (3.23%)
Severe depression episode without psychotic symptoms	5 (6.58%)	

The structure of diagnoses in patients after 60 years of age significantly differed from that in younger age groups. The predominant diagnosis in older patients were still bipolar disorder, with as many as 54.84% severe depressive episode without psychotic symptoms in the course of bipolar disorder; in second place among the most common diagnoses was severe depressive episode with psychotic symptoms in the course of bipolar disorder (19.35 %). Only 3.23% of patients after 60 years of age qualified for electroconvulsive therapy were people suffering from schizophrenia. In the population of older patients 12.9% were diagnosed with major depression in the course of recurrent depression, whereas in the population before 60 years of age treated with ECT this diagnosis accounted for only 3.95%. Therefore, it is noticeable that among elderly patients definitely increases the proportion of patients with psychotic symptoms. This relationship is also evident when analyzing the structure of diagnoses considering the mean age. Elderly patients directed to ECT were at the same time the most severely ill patients, before the application of ECT usually all the possibilities of other pharmacological treatment were used (Table 3).

Table 3. **Diagnosis and patient's age**

Diagnosis and patient's age	Mean age
BD, severe depression with psychotic symptoms	58.00
BD, severe depression without psychotic symptoms	54.74
BD, moderate depression	48.00
BD, manic episode	27.00
Recurrent depression, severe depression with psychotic symptoms	61.57
Recurrent depression, severe depression without psychotic symptoms	50.17
Schizophrenia	38.55
Severe depression episode with psychotic symptoms	49.00
Severe depression episode without psychotic symptoms	42.80

Almost all patients treated with ECT met the criteria for drug-resistance, except for two people assigned to ECT treatment because of the direct threat to life. As a criterion of drug-resistance the ineffectiveness of at least two properly conducted drug treatment (drugs with different mechanisms of action, the right time of application, therapeutic doses) was considered.

In order to achieve remission the series 8–12 procedures is advisable, however, the main factor determining the length of electroconvulsive therapy was the mental state of the patient. In cases where systematic but incomplete improvement was observed during the treatment or in case of a history of rapid deterioration after completion of ECT treatment, in some cases it was decided to carry out more than 12 ECT sessions.

This is in line with the recommendations of the Royal College of Psychiatrists' Special Committee on ECT [12].

The average number of procedures per treatment was 9.82 in the population before the age of 60 and 10.93 in the population over 60 years of age (Table 4). In case of 9 patients, treatment was discontinued after less than 5 ECT sessions. The reasons for this early discontinuation of treatment was in one case the mental deterioration after 4 procedures, in second case, the arbitrary dismissal of a patient from the hospital, in three cases withdrawal of consent for the ECT treatment, and in 4 other patients complications that occurred during ECT treatment. In one patient, the reasons for discontinuation of treatment were respiratory disturbances, significant decrease in oxygen saturation and difficulties in ventilation during anesthesia.

17 patients underwent a series of treatments exceeding 12 ECT procedures. The longest series of ECT was performed in 74-year-old patient suffering from severe depression with psychotic symptoms in the course of recurrent depression. In this case, initially 12 ECT sessions were performed and after 3 weeks due to rapid mental deterioration the series was continued and further 8 ECT sessions were performed (total 20 ECT).

Data on the number of ECT sessions are given in Tables 4 and 5.

Table 4. **Number of ECT performed in series**

Number of ECT performed in series	Mean
Population before 60 years of age	9.82
Population over 60 years of age	10.93

Table 5. **Efficacy of ECT before and after 60 years of age**

	Remission	Improvement	Incomplete improvement	No improvement	Worsening
Before 60.	32.89%	48.68%	7.89%	7.89%	2.63%
Over 60.	32.26%	61.29%	6.45%	0.00%	0.00%

The effectiveness of ECT

The effectiveness of electroconvulsive therapy was evaluated by psychiatrist using the Clinical Global Impression Scale (CGI). Remission was defined as relief of symptoms of depression or disappearance of psychotic symptoms (CGI 1), improvement – as reducing the severity of symptoms (CGI 2), incomplete improvement – as the partial reduction of symptoms (CGI 3), the lack of improvement – mental status such as mental state at the time of initiation of ECT (CGI 4), worsening – as the increase of the severity of depression or psychosis (CGI 5, 6, 7).

In the group of patients before 60 years of age the remission occurred in 32.89%, improvement was observed in 48.68% of patients, and incomplete improvement in 7.89%. It can therefore be concluded that ECT was partially or fully effective in up to

89.46% of patients. Considering the fact that almost all patients met criteria for drug resistance, the improvement would be by no means possible to obtain in the course of pharmacotherapy.

As regards the population over 60 years of age – lack of improvement or deterioration was not observed. Remission rate was similar to that in the younger age group (32.26%) and a significant improvement was observed more frequently than in younger patients (Table 5).

Referring to electroconvulsive therapy efficacy in individual diagnoses it can be concluded that remission is often obtained in the course of depression without accompanying psychotic symptoms. In the population of patients with psychotic depression, despite the improvement of mental state, i.e., resolution of positive symptoms and a significant reduction in the severity of depressive symptoms, it is usually impossible to achieve full recovery in the course of ECT. This relationship also applies to patients suffering from treatment-resistant schizophrenia. Although only in 3 cases out of 31 there was no positive effect of ECT, but remission was achieved also only in 3 cases. The efficacy of 80% (remission or significant improvement) with respect to severe drug-resistant form of schizophrenia appears to be extremely good result.

Detailed data about the efficacy of ECT in study groups, depending on the age and diagnosis are included in Tables 5 and 6.

Table 6. **Diagnosis and effectiveness**

	Remission	Improvement	Incomplete improvement	No improvement	Worsening
BD, severe depression with psychotic symptoms	3	6		1	
BD, severe depression without psychotic symptoms	22	16	2	3	
BD, moderate depression	1				
BD, manic episode		1			
RD, severe depression with psychotic symptoms	1	5	1		
RD, severe depression without psychotic symptoms	1	3	1		1
RD, moderate depression					
Schizophrenia	3	22	3	2	1
Severe depression episode with psychotic symptoms					
Severe depression episode without psychotic symptoms	1	1	1		
RD, severe depression with psychotic symptoms	3	2			

Safety of ECT

In the group of 107 patients undergoing ECT no serious complications such as death, life-threatening condition, hospitalization in another department or permanent injury have occurred.

In the group of patients before 60 years of age in 67.11% of patients none side effects have occurred in the course of electroconvulsive therapy. The most frequently reported adverse event was headache which was reported by 13.16% of patients. Memory impairment was observed in 6.58% of patients. Disturbances of consciousness occurred in 3.95% of patients before 60 years of age. Contrary to the authors' predictions and data from the literature, the disturbance of consciousness occurred less frequently among elderly patients than in younger age group (it occurred in 3.25% of patients).

The most common adverse effect in patients over 60 years of age was memory impairment that was observed in as many as 22.58% of respondents. It is worth mentioning that all ECT procedures carried out in 2013 and 2014 were bilateral and bitemporal. According to results of the research and clinical observations made by the authors, unilateral technique significantly reduce the incidence of memory impairment. Usually, unilateral ECT is also better physically tolerated, the increase of blood pressure and cardiac arrhythmias are rarely observed. In the described population in the course of bitemporal treatment arrhythmia occurred in the group of patients over 60 relatively frequently (it occurred in five patients –19.35%). The risk of cardiac complications during ECT increases with age. In the population of patients who are before 60 years of age arrhythmias occurred in only 3 cases (5.26%). This relationship seems to be a logical consequence of cardiovascular diseases, which are usually present in the population of elderly patients. Altogether in both populations arrhythmias were observed in 8 out of 107 patients enrolled in the study. In most patients, arrhythmias were transient and resolved within several minutes after the procedure, in 3 cases it was decided to cease the ECT treatment because of severe arrhythmias in the form of bigeminy and trigeminy.

In one case it was decided to discontinue ECT after the first procedure due to severe respiratory disturbances in a patient with severe obesity and severe obstructive sleep apnea caused by the collapsing of the upper respiratory tract (what turned out in the course of further investigation after discontinuation of ECT).

Teeth fractures during ECT were rare and during 1,086 procedures occurred in 2 patients, of which 1 person was before 60 and 1 over 60 years of age.

Other side effects that occurred in the described population were myalgia and transient decreases in oxygen saturation during the procedure.

In some cases during ECT treatment the occurrence of several adverse effects was reported.

Table 7 presents adverse events before and after 60 years of age

Table 7. **Adverse events before and after 60 years of age**

	Before 60 years of age	Over 60 years of age
Headaches	13.16%	9.68%
Memory impairment	6.58%	22.58%
Arrhythmias	5.26%	19.35%
Disturbances of consciousness	3.95%	3.23%
Fractures of teeth	1.32%	3.23%
Others	2.63%	0.00%
No adverse events	67.11%	41.94%

Discussion

The results of this study confirm the efficacy of electroconvulsive therapy both for depressive as for psychotic disorders. The therapeutic effect was observed in 89.46% of patients before 60 years of age and in 100% of patients over the age of 60. In the group of elderly patients remission rate was similar to that in the younger age group (32.89% vs. 32.26%) and the percentage of patients with significant improvement was even higher (61.29% in the population over the age of 60 vs. 48.68 % in the population before the age of 60). No improvement was observed in 7.89% and worsening in 2.63% of patients at a younger age. In a population that exceeded 60 years of age, all patients benefited from the treatment. These results confirm data from the literature that ECT treatment efficacy in older age group is similar, and according to some authors even higher than in younger age groups. [5, 6, 13–16].

The results show that ECT is more effective in drug-resistant depression occurring in the course of recurrent depression than in bipolar disorder [6]. Based on the present study we can draw the opposite conclusion – remission rate and a significant improvement rate was much higher in a group of patients with bipolar disorders than in patients with recurrent depression. However, it should be noted that in the group of patients treated for depression in the course of recurrent depression were only 13 people, so the result might be falsified due to the low sample size.

Electroconvulsive therapy is, according to data from the literature [6], particularly effective for patients with psychotic depression, often the improvement is noticeable after a first few sessions. In the analyzed population of 107 patients remission was achieved more frequently in patients with depressive disorders without psychotic symptoms. In the population of patients with psychotic depression improvement of the mental state, i.e., resolution of psychotic symptoms and a significant reduction in the severity of depressive symptoms was observed, but usually it was not possible to achieve full recovery in the course of ECT. Among patients eligible for ECT due to life-threatening health conditions (not taking food and liquids, cachexia in the course of depression, intense suicidal thoughts, catatonic schizophrenia), significant improvement in mental status was observed in all cases.

Tolerance of ECT in the population of elderly people is worse than in younger patients. The biggest problem in the older study group were cardio-vascular complications and cognitive impairment. Disturbances of consciousness were rarely seen in the group of elderly patients, much less often than it could have been expected [13–23] and occurred just as often as in patients before 60 years of age (3.95% vs. 3.23%).

In the population of older patients suffering from depression coexisting with memory impairment related to physiological aging, mild cognitive impairment or dementia – the greatest concern are retrograde amnesia and subsequent memory impairment after ECT, which causes deterioration of cognitive function [13–23].

Data from the literature and observations of other researchers indicate that the use of unilateral ECT with electrodes placed over the non-dominant hemisphere may affect the reduction in the incidence of cognitive impairment [7]. All the sessions in the presented study were performed in bilateral technique, what may be the cause of the relatively high prevalence of memory impairment observed in the population of patients over 60 years of age (22.58%).

At present, in the Institute of Psychiatry and Neurology both unilateral and bilateral procedures are performed.

Cardiovascular complications are often the cause of death and serious complications; for this reason the risk of periprocedural complications in the group of elderly patients is increased. The presence of coronary artery disease, hypertension, heart failure, and arrhythmias increases the risk of cardiac complications during anesthesia or in the period after the ECT procedure. Patients over 60 years of age shall be subject to more thorough preliminary procedure (e.g. additionally 24-hour Holter monitoring or echocardiography). A high percentage of cardiac complications in the population of older patients observed in this study can be explained by the small sample size. To determine the actual risk of somatic complications in a population of elderly patients, further work involving a larger number of patients is necessary.

High efficiency of ECT treatment both in depressive and psychotic patients, including drug-resistant ones, indicates that this method should be used frequently and should not be available only for the treatment of severe depressive syndromes and catatonic schizophrenia, because the group of patients with moderate symptoms severity and insufficient effectiveness of pharmacotherapy can achieve significant benefits from ECT treatment.

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