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ELECTROCONVULSIVE THERAPY - HISTORY AND CURRENT USE IN PSYCHIATRY: A LITERATURE REVIEW

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ABSTRACT

Despite the numerous controversies associated with electroconvulsive therapy, in its favor is the relatively low number of contraindications, side effects and high level of safety.

Purpose: The purpose of the publication was to collect and organize information on the use of electroconvulsive therapy in psychiatry and its effectiveness in specific disease entities, such as depression, schizophrenia, bipolar affective disorder and PTSD.

Methods: A literature review was conducted using PubMed and Google Scholar containing information on the use of ECT in psychiatry. The search focused on the words electroconvulsive therapy, ECT, schizophrenia, depression, PTSD, bipolar affective disorder. Priority was given to using recent articles.

Results: According to the most reliable sources, electroconvulsive therapy has a beneficial therapeutic effect in patients with depression, PTSD, schizophrenia and bipolar affective disorder.

Conclusions: Due to the commonness of mental illnesses and the co-occurring resistance to pharmacological treatment, modern psychiatry is looking for alternative methods. One of them is electroconvulsive therapy, which has undergone modifications over time and is today considered a method with a high safety profile. Beneficial effects of the use of ECT can be observed in patients with bipolar disorder, schizophrenia and depression, and research on its effectiveness in the case of PTSD is still ongoing. ECT can be used in pregnant women, in patients with treatment-resistant depression and at high risk of suicide.

Keywords: electroconvulsive therapy, ECT, schizophrenia, depression, PTSD, bipolar affective disorder

INTRODUCTION

Electroconvulsive therapy (ECT) is an effective and relatively safe procedure with a low risk of

complications. The history of using electric current in medicine dates back to ancient times, and by the 20th century, attempts were made to apply it in psychiatry. Numerous studies conducted over the years have led to the refinement of the method and an increase in its safety profile. Today, there are several forms of electroconvulsive therapy. Indications for ECT include depression, manic episodes, catatonia, and schizophrenia. ECT is particularly helpful in cases of treatment-resistant depression and is also beneficial for pregnant women due to the limited options for pharmacological therapy. Research confirms the effectiveness of ECT in treating schizophrenia and bipolar disorder, and meta-analysis results suggest it may be a beneficial form of treatment for PTSD. Individual adjustment of the dose and technique of the procedure is crucial for the effectiveness of electroconvulsive therapy.

METHODS

We reviewed the literature on the history, technique of performance and application to specific disease entities in the field of psychiatry. We used articles available in PubMed, Google Scholar and the specialized literature. We focused on articles on the use of ECT in schizophrenia, depression, bipolar disorder and PTSD.

RESULTS AND DISCUSSION

HISTORY OF ELECTRIC SHOCKS

As early as ancient times, attempts were made to use electricity in therapeutic procedures, and for obvious reasons, natural sources of electricity such as current-generating fish were used for this purpose. According to Alexander and Selesnick's account in the "History of Psychiatry," the first use of electric therapy is attributed to Scribonius the Great, who was the physician to Emperor Claudius; he was said to have applied electric therapy to patients with headaches and gout by applying electric fish to the painful area. One of the patients was said to be Emperor Claudius himself. Galen also described applying electric fish to the head of patients with mood and behavioral disorders and headaches. Similar electrical therapy methods were practiced by Avicenna, Averhoes and others until the 16th century. In Europe, electric fish therapy survived until the 19th century, gradually being replaced by techniques using artificial electricity [1, 2].

A significant moment on the road to the development of electroconvulsive therapy as we know it today was in 1934, when Ladislas Joseph Meduna (1896-1964) used the induction of seizures to treat schizophrenia; a patient with catatonic schizophrenia was given an intramuscular injection of camphor; after 5 treatments, both the symptoms of catatonia and psychosis disappeared. In 1935, Meduna published the results of a study of 26 patients, 10 of whom had resolution of their symptoms and 3 of whom had significant improvement.

Initially, he used camphor (10-40ml of a 25% solution) to induce a seizure, which (as a result of many side effects) he abandoned in favor of pentylenetetrazole (cardiazole, a GABA receptor antagonist). In 1939, Meduna published the results of a study of 110 patients, most of whom achieved significant improvement. Initially, cardiazole shocks were very popular, but they were withdrawn due to strong side effects such as feeling anxious and "freezing" moments before the onset of seizures, and as a result, patients were afraid to take another cardiazole [1, 4].

Many people from the world of science and medicine have experimented with the use of electric shocks in medical practice. In 1893-1895, Sigmund Freud proposed this method of treatment for a woman suffering from "hysteria and muscular disorders," however, as a result of unsatisfactory results, he abandoned further research into the technique. Years later, he expressed critical opinions on the use of electroconvulsive therapy [5, 6].

In 1938 in Italy, Ugo Cerletti (1877-1963) and Lucio Bini (1908-1964) introduced electroconvulsive therapy (ECT) into medical practice, replacing pentylenetetrazole with electric current, for which reason they are referred to as the fathers of electroconvulsive therapy. After Lucio Bini constructed an electrical stimulator generating a maximum current of 80-100-110-125V with a short flow time, researchers conducted experiments on dogs and pigs to determine the optimal conditions for electrical stimulation. Different current flow times and also current directions were tested (by locating electrodes in different locations on the body), and it was eventually determined that twitching is safest when the electrodes are located on the temples [7].

On April 15, 1938, electroconvulsive treatment was performed for the first time on a patient with schizophrenia, but the attempt was ineffective and did not induce a seizure, a current of 80V and a flow time of 0.1 seconds was used. The next day, the treatment was repeated using a voltage of 100V for 1.5 seconds; the patient no longer showed symptoms of psychosis after waking up. The full treatment of the first patient subjected to electroconvulsive therapy amounted to 11 full treatments and 3 incomplete treatments, the improvement obtained lasted at least a year, but at a later time the symptoms returned with much less intensity [8]. The technique of inducing seizures with electroconvulsive therapy has proven to be much more effective and safer than the use of chemical substances, and as a result it has gained

popularity and has been widely used in many psychiatric centers [9]. Initially used mainly for the treatment of schizophrenia, over time its use has been extended to other psychiatric disorders, particularly those related to emotions. Originally, the procedure was performed without the use of anesthesia, but in 1952 general anesthesia (modified ECT) was used to avoid potential injuries and fractures in patients [10].

The introduction of curare and its synthetic derivatives, such as succinylcholine, scopolamine (replaced by atropine) and short-acting barbiturates, significantly improved the safety of Electroconvulsive Therapy (ECT) treatments. These drugs became the basis for pharmacological modifications of ECT. Scopolamine helped relieve vegetative symptoms associated with excessive vagus nerve stimulation. Curare derivatives eliminated complications associated with vertebral or long bone fractures. Barbiturates, on the other hand, improved comfort with premedication, allowing the patient to avoid stressful situations associated with respiratory distress and unconsciousness before the procedure itself. Despite these advances, ECT procedures were still performed without pharmacological premedication in some centers until the 1980s and beyond [1, 11, 12].

The discovery of the first psychotropic drugs and the rise in popularity of the anti-psychiatry movement in the late 1950s/60s, significantly reduced the use of ECT (especially in the US). Nevertheless, cases of patients who were insensitive to the drugs contributed to a resurgence in ECT's popularity. In 1985, the National Institute of Mental Health and the National Institutes of Health held a meeting on Electroconvulsive Therapy (ECT) treatments, which concluded that it was one of the most controversial therapies used in psychiatry. Despite causing significant side effects, it has been found to be effective in treating many serious psychiatric disorders [13]. Following the re-acceptance of ECT as a treatment for mental illness, numerous observations and clinical studies have been conducted to help understand the mechanisms of action and effectiveness of Electroconvulsive Therapy in psychiatry. It turns out that despite the considerable hopes placed on pharmacotherapy in the 1980s, it has not been able to meet all the expectations set, nor can it completely supplant ECT (which is the only one of the historical methods of psychiatric treatment that has survived to the present day) [14, 15, 16].

Currently, it is estimated that about one million people undergo ECT therapy annually. In different parts of the world, we can observe a slightly different profile of ECT patients; in Western countries, the majority of patients who undergo therapy are older women with emotional disorders, while in Asian countries they are usually young men suffering from schizophrenia. Despite the proven effectiveness and familiarity of the ECT method for many years, it is still chosen infrequently, which may be due to poor public perception [1, 17].

ECT - TECHNIQUE OF PERFORMANCE

The purpose of ECT is to induce a seizure under anesthesia.In order to perform the procedure, the patient must give informed consent, meet strict conditions and prepare accordingly. The personnel needed to carry out the procedure usually consists of a psychiatrist, anesthesiologist and nurse, medical equipment and supplies such as (anesthesia induction agents and drugs, ventilation and resuscitation equipment, oxygen mask, stethoscope, blood pressure monitor, electrocardiograph (ECG), pulse oximeter, suction machine and oxygen delivery system, electromyograph (EMG), electroencephalography (EEG) electrodes will also be necessary [18, 19].

Preparing the patient, the basis is to make sure that the patient has no contraindications to the procedure, such as severe cardiovascular disorders, epilepsy, fresh stroke, uncompensated diabetes.... If taking medications, the patient should discontinue medications such as benzodiazepines, anticonvulsants, lithium salts, clozapine, tricyclic antidepressants. The patient should be fasting a minimum of 12 hours before performing ECT [19, 22].

Before the procedure, it is necessary to perform:

- ECG
- EEG
- Chest X-ray (in case of lung diseases)
- evaluation of dental status
- MMSE evaluation of cognitive function
- fundus examination
- laboratory tests: electrolytes, morphology, glucose, AST, Alt, TSH, creatinine, urea
- gynecological consultation (in the case of pregnant women)

Immediately prior to the procedure, the patient undergoes a physical examination and a memory evaluation. In connection with the use of anesthesia, anesthetic drugs are administered to the patient when the procedure is performed [19, 20, 22].

When choosing anesthetic drugs, one should take into account their effect on the seizure threshold; the gold standard is methohexital from the barbiturate group. Methohexital is administered at a dose of 0.75 to 1 mg/kg. A drug of equal choice is propofol, particularly indicated in patients with cardiovascular problems and passing nausea and vomiting after anesthesia. According to the study, the efficacy of ECT after administration of propofol and methohexital are comparable, however, the duration of the seizure was shorter with propofol, on the other hand, patients complain less often of nausea and vomiting when using propofol. Another drug used is etomidate, showing high efficacy in people with cardiovascular problems and other somatic conditions, worth considering if very brief seizures were induced during previous treatments [18, 22].

Muscle relaxant drugs are used in ECT procedures, the main reason being to avoid fractures and other musculoskeletal damage associated with the occurrence of sudden movements. For this purpose, succinylcholine which belongs to the group of depolarizing muscle relaxants is mainly used. Succinylcholine is administered at a dose of 0.75 to 1 mg/kg of body weight, in the case of contraindications to its use, non-depolarizing muscle relaxants are chosen in cases of hyperkalemia, pseudocholinesterase deficiency, burns or neuromuscular injuries. It is important to remember to protect the teeth and tongue because under the influence of an electrical impulse there will be a contraction of the masseter which muscle relaxants will not prevent [18, 22].

In the case of ECT procedure, the most important factors modifying the course are the place of electrode application, the time of pulse digestion and the amount of voltage used. Each factor affects the effectiveness of the procedure performed, the occurrence of side effects [20, 21, 22].

Basically, there are two ways of applying electrodes in ECT treatment, the two-sided method in which electrodes are placed at the temples in both hemispheres, and the single-sided method where electrodes are placed on the temple (usually the non-dominant hemisphere) and the top of the head. According to studies, bicrontal stimulation carries a higher risk of side effects, mainly concerning cognitive dysfunction, and is the preferred method for severely ill patients who refuse to take food. With this method, we can use a lower voltage, usually exceeding 1.5 times the seizure threshold is sufficient to induce a seizure. A certain modification of the bicortical method is the bicortical method which, according to some centers, carries a lower risk of cognitive impairment. The results of a meta-analysis conducted on 1,415 patients with depression, showed that three days after ECT there was a deterioration in cognitive function, autobiographical and verbal memory, but this was temporary. Studies show that single-scratch treatments are associated with a lower risk of cognitive impairment, only exceeding the seizure threshold 8 times showed comparable adverse effects to the two-scratch method. The single-temporal method is considered by many to be the treatment standard, with 5-6 times the seizure threshold usually recommended when using it. The seizure threshold is determined individually for each patient, usually this is done during the first treatment session selecting the appropriate current doses. In case of failure of ECT using the single-temporal method, a change in electrode placement should be considered [18, 21, 22, 24]. Pulse duration is also under debate, with short pulses (0.5 -1.5 milliseconds) or ultra-short pulses (less than 0.5 milliseconds) being used. Currently, the standard is the use of short pulses, but some studies report a lower risk of causing adverse symptoms with the use of ultrashort pulses, research on their use and potential benefits is still ongoing. Currently, the use of ultrashort pulses is not recommended for those in the most severe condition with a high risk of suicide. The duration of the induced seizure is also an important parameter, as a rule it is in the range of 15 to 70 seconds, it can last longer but this is associated with a greater risk of cognitive impairment, while too short a seizure can be ineffective, some researchers believe that already seizures lasting minimally longer than 15 seconds can give improvement in patients [18, 19 22].

Another important component of ECT treatments is the selection of the appropriate dose, initially dependent on age, currently a titration method is used. The goal is to induce a seizure, therefore, the seizure threshold should be determined first and then the pulse amplification should be applied repeatedly. Conducting ECT is done under EEG control, one method of dose selection is to evaluate EEG parameters such as amplitude, seizure discharges, postictal phase, stereotypy, this method is considered by many specialists to be more effective and convenient. Some centers also use fixed doses, which are initially 100% of the maximum dose, which is then modified as needed [22].

The use of ECT carries a risk of side effects, the literature reports such symptoms as headaches, muscle aches, toothaches, nausea, cognitive dysfunction, post-partum anxiety. The procedure is associated with a risk of cardiac arrhythmias, aspiration or fractures; fatal cases account for a very small percentage of 1 in 50,000 ECT. Adverse symptoms mainly affect the elderly or those burdened with other diseases, the risk of choking is related to the fact that the patient was not fasting before the procedure. It is a very safe therapy [21, 22, 23].

INDICATIONS

The prevalence of electroconvulsive therapy (ECT) is due to its applicability to patients taking multiple

medications, pregnant women, or elderly patients [25].

ECT is mainly used in disorders such as:

- Depression in the course of unipolar and bipolar affective disorders and in the course of schizophrenia.
- Severe episodes of mania in the course of ChAD.
- Acute catatonia.
- Schizophrenia in which ECT treatment performed previously has been beneficial.

There are several systematized indications for performing ECT. These have been issued by EU and US countries. Their guidelines have been presented by, among others: American Psychiatric Association (APA), B. Wild and Kalinowski.

The American Psychiatric Association (APA) made the following recommendations:

ECT treatment as a first choice method is recommended when:

- a rapid therapeutic response is needed due to the severity of the psychiatric disorder or severe somatic condition.
- the losses from pharmacotherapy outweigh the benefits.
- lack of improvement after pharmacotherapy, or the presence of a good therapeutic response to ECT treatments during previous episodes of the disease.
- the patient prefers this method of treatment.

ECT treatment as a second-choice method is recommended when:

- drug resistance is present.
- side effects from pharmacotherapy are greater than would be expected from ECT.
- there will be a deterioration of the psychological or somatic condition requiring prompt, effective therapy [26, 28].

German psychiatrist Wild also systematized the indications for ECT treatment. The following disease entities appeared in them: disorders with aggravated depressive symptoms, manic syndrome, refractory schizophrenia, and catatonia and malignant neuroleptic syndrome. Interestingly, he also included Parkinson's disease, epilepsy and dystonias in his recommendations as conditions for which electroconvulsive therapy can be used [26, 29].

In his work, Kalinowski outlined the following indications for elective ECT:

- Affective disorders in the form of depression (psychotic, with increased suicidal thoughts and tendencies, with increased psychomotor anxiety, with concurrent somatic diseases).
- Acute catatonia.
- Acute mania.

As a second-choice method, the indications are:

- drug-resistant depression.
- Chronic depression in the course of affective disorders.
- Depression in the elderly.
- affective disorders (major depressions), schizophrenic and schizoaffective disorders in pregnant women.
- malignant neuroleptic syndrome.
- catatonic schizophrenia.
- refractory schizophrenia [26, 30].

CONTRAINDICATIONS

There are few situations during which special caution should be exercised when performing electroconvulsive therapy. ECT should not be performed if the patient has serious neurological diseases, severe cardiovascular disorders (fresh myocardial infarction, complex cardiac arrhythmias), significant

hypertension, coagulation disorders. Disqualifying neurological diseases include epilepsy, encephalitis, fresh stroke or increased intracranial pressure, among others. Significant osteoporosis and diseases related to the organ of vision (including acute glaucoma attack), as well as uncompensated diabetes and renal failure may also exclude [25, 26, 27, 30].

SIDE EFFECTS

Electroconvulsive therapy, like other forms of treatment, carries the risk of side effects. Side effects are noted on average for every 4 ECT treatments performed. They are usually mild. They are divided into short-term and long-term.

During the procedure itself, sudden changes in blood pressure, respiratory and cardiac disturbances may occur. Most often, these complaints are manifested in patients who have a positive medical history of these two systems. The symptoms usually withdraw without additional intervention.

Among the short-term side effects of electroconvulsive therapy are muscle and jaw pain, headaches, vomiting and nausea. Almost half of patients are affected by temporary memory impairment (from the perioperative period). These symptoms are short-lived and transient, and it is not necessary to treat them. They usually cease on the first day after surgery.

According to the data, the most common long-term complication is memory loss from before treatment. Memory problems occur in patients both during and after treatment. These symptoms subside after about a month, in rarer cases after several months. In some people who have undergone treatment, it is difficult to determine whether the memory lapses are due to the ECT performed or to the progression of the disease before treatment. Severe complications developing as a result of ECT therapy occur with an average frequency of 1:50,000. It is a relatively safe treatment method.

ECT, like other treatments, carries the risk of side effects. However, it is important to remember that untreated ECT is equally dangerous. An untreated patient has a higher risk of acquiring long-term disability, committing suicide or dying of cachexia [20, 25].

DEPRESSION

According to 2019 statistics from the National Health Service, about 1 million Poles suffer from depression (2.6% of women and 2% of men). [34] Severe depression is a potentially life-threatening illness, and it is associated with an increased risk of suicide. [31] Data made available by the Polish Police on the number of suicides committed due to mental illness/disorder are as follows: 2017 r. - 1017 suicides, 2018- 1037 suicides, 2019. - 963 suicides, 2020 - 1033 suicides, 2021 - 1068 suicides, 2022 - 1034 suicides, 2023 - 1171 suicides [35]. These data do not apply only to suicides committed on the basis of depression, but it shows the scale of the problem.

If a depressed patient does not improve after a minimum of two different antidepressants, we can talk about treatment-resistant depression (TRD) [36]. Treatment resistance affects up to 30% of depressed patients, that is, one in three patients may not respond with improvement to medication. The longer the episode, the greater the risk of not having this response. In this case, achieving remission quickly is extremely beneficial. In such cases, electroconvulsive therapy comes to the rescue, which has been one of the most effective methods for 80 years [31].

ECT is most effective in patients with depression coexisting with psychotic symptoms and patients with severe depression. This therapy is also applicable to patients at high risk of suicide or where other forms of treatment have failed to improve satisfactorily [32]. Additional indications include psychosis in pregnancy and significant abnormalities in laboratory tests (e.g., agranulocytosis) [36]. ECT in unipolar and bipolar depression has similar effects [33].

Electroconvulsive therapy for depression consists of an acute phase and a maintenance phase. The former is usually a series of 8-12 treatments (treatments are given 3 times a week). The maintenance phase consists of treatments at different frequencies, tailored to the individual needs of the patient [32]. Before the treatments are performed, the patient must undergo specialist consultations with an internist, anesthesiologist, ophthalmologist and neurologist. Abnormal intracranial pressure is the only absolute contraindication [33]. On average, 1/2 of patients undergoing ECT achieve a response after just 3 treatments (after about a week). The therapy carries the risk of side effects, including retrograde amnesia, disorientation, and learning difficulties. Symptoms usually withdraw [36].

Do not forget to continue drug treatment after all electroconvulsive treatments, despite their effectiveness. The risk of relapse is quite high (up to 85%). There is a particular danger in the first six months. In addition to pharmacotherapy, maintenance EW therapy (performed every 2-6 weeks) has a beneficial effect in preventing relapse [31]. In addition, it does not increase the risk of adverse side effects on cognitive function. If a relapse has already occurred, maintenance therapy can be performed again [32].

SCHIZOFRENIA

Schizophrenia is a chronic illness belonging to psychotic disorders. It affects about 1% of the population. The name itself comes from the Greek words schizis (to cleave) and phren (mind). The essence of this disorder is functional and structural changes in the brain. Patients manifest maladjusted or shallow affect, problems in interpersonal relationships and disruptions in thought and perception. Patients additionally face misunderstanding from society. There are several types of schizophrenia according to the ICD-10 classification, these are:

- paranoid schizophrenia
- hebephrenic schizophrenia
- catatonic schizophrenia
- undifferentiated schizophrenia
- post-schizophrenic depression
- residual schizophrenia
- simple schizophrenia.

The treatment of choice is pharmacotherapy - antipsychotic drugs. The goal is to treat exacerbations and prevent relapses. Non-pharmacological treatment, more specifically, biological therapy, can also be used. It includes electroconvulsive therapy [37, 38, 39]. The American Psychiatric Association (APA) lists the main diagnostic criteria when ECT is applicable. Among them, schizophrenia is listed, more specifically:

- Schizophrenia, where the current episode is characterized by an acute and sudden onset.
- Catatonic schizophrenia.
- schizophrenia, when the use of ECT therapy has provided good results in the past [26].

ELECTROSHOCK IN THE TREATMENT OF CATATONIC SCHIZOPHRENIA - A CASE REPORT

Catatonic schizophrenia is a very rare and severe type of schizophrenia. Psychomotor drive disorders (ranging from inhibition and agitation) are characteristic. In addition, there are disorders of urges (such as food intake) and difficult contact with the patient (silence, "stasis"). Catatonic stupor, or extreme immobility, can transform into severe psychomotor agitation and then back into stupor [40, 42, 43].

Such therapy was also applied to a man whose case was described in 2009. The man had been suffering from schizophrenia for about 20 years. The same diagnosis was given to his father and younger brother. The patient's first psychotic symptoms appeared in his fifth year of college. At that time, he was diagnosed with acute multiple psychotic disorder. He subsequently had several hospitalizations in a psychiatric ward. In 1995, he was admitted to the hospital with symptoms of catatonia, and was then diagnosed with negative symptoms of schizophrenia. For the next 10 years, he felt fairly well. In 2007, he was admitted to the ward with paranoid-depressive symptoms. During his hospitalization, his response to medication was poor. A delusional interpretation of reality and negative symptoms were present. The patient was taking sulpiride and olanzapine. During another hospitalization, despite intensive pharmacotherapy, there was no improvement. In mid-April 2009, catatonic symptoms appeared, including refusal to take medication and meals. On April 24, 2009, neuroleptic drugs were discontinued. The patient took only benzodiazepines. In May 2009, he was transported to the Department of Clinical Psychiatry and admitted as a patient unable to give informed consent for hospitalization. In addition, consent was requested for an electroshock treatment. The first EW procedure was performed on May 14, 2009. An abnormal EEG recording was observed during the seizure. The readable recording mainly showed fast field activity without asymmetry or obvious seizure changes. Eventually, after 8 EW treatments, the patient's condition improved: he was in logical contact, showed no psychotic symptoms, ate meals independently and moved around in bed. Ultimately, 12 EW treatments were performed (the last 2 were maintenance treatments). The patient had been taking aripiprazole since June 2009. The man was in good mental condition, i.e., he showed no psychotic symptoms, and was auto and allopsychically oriented. On the other hand, he had memory disorders (memory gap from September 2008 to May 2009). In addition, the man had difficulty sorting out events from his past. A gradual improvement in memory function was observed. His ability to remember new information and concentration remained at a good level [41].

Catatonic schizophrenia is currently a rare form of schizophrenia, in addition, it poses its own kind of treatment challenge. Difficult contact with the patient, lack of cooperation hinders the treatment process. Electroconvulsive therapy is often used in such cases. It makes it possible to achieve remission of symptoms [40]. This was also the case with the patient described above. Electroconvulsive therapy allowed symptoms to withdraw, but was associated with side effects.

ECT IN PTSD

Exposure to various types of traumatic experiences increases the chances of developing psychiatric disorders such as depression, anxiety disorders, bipolar disorder or post-traumatic stress disorder (PTSD). In the course of PTSD, there may be symptoms of numbness, failure to remember some aspects of the trauma, a sense of separation from others, reenactment of the traumatic event or persistent avoidance of trauma-related stimuli, a fixed negative emotional state that occurred after experiencing the trauma, and changes in behavior including excessive agitation [44].

Treatment of PTSD currently relies mainly on psychotherapy and pharmacological agents, these methods have limited effectiveness so alternative treatments are being sought. The prevalence of PTSD is higher in women than in men, at 3.6% in men and 9.6% in women, respectively. Pharmacological treatment mainly uses antidepressants with serotonin reuptake inhibitors. Psychotherapy in the treatment of PTSD usually follows a cognitive-behavioral approach. Publications on the treatment of PTSD mostly indicate that psychotherapy is more effective than pharmacology [44, 45]. There have also been attempts to use electroconvulsive therapy (ECT) and transcranial magnetic stimulation (rTMS) to treat post-traumatic stress disorder. There are not many studies confirming the efficacy of ECT in the treatment of PTSD; a meta-analysis of five studies on 110 patients with PTSD symptoms who received ECT observed a reduction in symptoms in a small proportion of patients, concerning persistent avoidance of stimuli associated with the trauma, excessive arousal, and recurrent persistent thoughts related to the trauma experienced. The results of the meta-analysis suggest that ECT may be a beneficial form of treatment for patients with PTSD [45].

BIPOLAR AFFECTIVE DISORDER

Bipolar affective disorder (BD) manifests itself as mania, depression or mixed states. It can be said that mania and depression are their opposites, and as a result, matching appropriate pharmacotherapy is a more complex process than for depression alone. The disease is chronic and recurrent in nature and therefore it is very important to select appropriate maintenance therapy [46]. Depressive states generally last longer than states of mania, they can last for months or even years, according to a 5-year study conducted in the US, the average duration of a manic episode lasted 7 weeks and a depressive episode 11 weeks [47, 48].

The mainstay of treatment for bipolar disorder is pharmacotherapy; however, in refractory to treatment, or in other justified cases such as pregnancy, high suicide risk, or severe catatonic states, electroconvulsive therapy can be used [46, 49].

A retrospective study was conducted which included data on the performance of electroconvulsive treatments (ECT) in 43 patients hospitalized in psychiatric clinics of the Institute of Psychiatry and Neurology, with the aim of determining the effectiveness of ECT therapy in various psychiatric disorders including patients with bipolar affective disorder. Eleven patients with CHAD were qualified for ECT; the most common reason for qualifying for the treatment was drug-resistant depression in the course of bipolar affective disorder. Treatment with ECT resulted in remission in 8 patients, improvement in 1 patient and no improvement in 2 patients. The efficacy of ECT was highest in patients with catatonia and in drug-resistant depression in the course of ChAD [50].

CONCLUSIONS

Due to the commonness of mental illnesses and the co-occurring resistance to pharmacological treatment, modern psychiatry is looking for alternative methods. One of them is electroconvulsive therapy, which has undergone modifications over time and is today considered a method with a high safety profile. Beneficial effects of the use of ECT can be observed in patients with bipolar disorder, schizophrenia and depression, and research on its effectiveness in the case of PTSD is still ongoing. ECT can be used in pregnant women, in patients with treatment-resistant depression and at high risk of suicide.

SUMMARY

The prevalence of mental illness and the accompanying resistance to drug treatment is forcing a search for alternative ways to combat the disease. Despite the passage of years, electroconvulsive therapy is still used as a form of treatment in psychiatry. Over the years, the form of ECT has undergone modifications, the key being the introduction of anesthetic drugs, which greatly improved the safety profile of the procedure. Despite the numerous controversies associated with electroconvulsive therapy, in its favor is the relatively low number of contraindications, side effects and high level of safety. It is currently used in patients with depression, schizophrenia and bipolar affective disorder. This form of treatment is distinguished by its ability to be used in pregnant women. Beneficial effects are also observed in drug-resistant depression and at high risk of suicide. Depending on the individual needs of the patient, we distinguish several methods of conducting electroconvulsive therapy in which the variable parameters are the placement of electrodes, the duration of the pulse, the dose and the number of sessions. Research is still being conducted on the

effectiveness of ECT in the treatment of PTSD.

AUTHOR CONTRIBUTIONS

Piotr Czerniak, Julia Buszek, Alicja Kosel, Maria Smółka, Adrianna Antoszewska: conceptualization, literature review, writing - original draft preparation; Weronika Kamińska, Adrian Bobrzyk, Maciej Rumian, Weronika Bargiel, Dominika Bąk: literature review, writing - review and editing.

All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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