

THE USE OF ELECTROCONVULSIVE THERAPY (ECT) AS A TREATMENT FOR DEPRESSION

Letícia Silva Scarpat

Centro Universitário do Espírito Santo
(UNESC)
Colatina - ES
<https://orcid.org/0009-0003-1051-198X>

Larissa Racanelli Martins

Centro Universitário do Espírito Santo
(UNESC)
Colatina - ES
<https://orcid.org/0009-0008-2378-4350>

Henrique Lima Rufeisen

Pontifícia Universidade Católica de
Campinas (PUCCAMP)
Campinas - SP
<https://orcid.org/0009-0003-7121-1382>

Laís Casotti Zanoni

Faculdade Brasileira de Cachoeiro de
Itapemirim (MULTIVIX)
Cachoeiro de Itapemirim - ES
<https://orcid.org/0009-0008-0777-8911>

Erika Rodrigues Ricart

UNIDERP
Campo Grande - MS
<https://orcid.org/0009-0005-1491-5169>

Júlia Lara Lago de Queiroz

Centro Universitário Atenas (UniAtenas)
Valença - BA
<https://orcid.org/0009-0001-7895-2373>

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Beatrice Buffon Puppim

Escola Superior de Ciências da Santa Casa de
Misericórdia de Vitória (EMESCAM)
Vitória - ES
<https://orcid.org/0009-0002-5679-448X>

Isabella Nepomuceno Soares

Centro Universitário de Mineiros
(UNIFIMES)
Trindade-GO
<https://orcid.org/0009-0005-6420-5798>

Amanda Villar Lino

Universidade Federal de Santa Catarina
(UFSC)
Araranguá - SC
<https://orcid.org/0009-0007-7000-1489>

Lais Mara Sampaio Pinheiro Lima

Unichristus (UC)
Fortaleza - CE
<https://orcid.org/0009-0005-1841-1013>

Bárbara Bianca Pereira Rocha

Universidade de Rio Verde (uniRv)
Formosa - GO
<https://lattes.cnpq.br/5673582961389394>

Myrna Maria Costa de Melo Silveira

CENBRAP
São Paulo - SP
<https://orcid.org/0009-0000-7749-7180>

Abstract: Objective: Evaluate how Electroconvulsive Therapy impacts treatment efficacy and quality of life in patients with resistant depression, as well as its safety and adverse effects. **Methods:** Bibliographic review using the PVO strategy, carried out in the PubMed - MEDLINE database, using the terms “Electroconvulsive Therapy”, “ECT” and “Depression”. Initially covering 1,454 articles, articles were selected between 2019-2024, in English and that addressed the research theme, thus selecting 19 articles. **Review:** Despite being a treatment surrounded by stigma and doubts from both professionals and patients, the present study was essential to elucidate the real benefits and care linked to ECT. It was found that the treatment is very cost-efficient for controlling patients with severe and refractory depressive episodes, as well as suicidal ideation, even more efficient when compared to drug therapy and psychotherapy. Furthermore, this proposal involves possible adverse effects related to structural changes in the Central Nervous System, as well as symptoms of nausea, amnesia and headache. **Final considerations:** Despite being associated with adverse effects, mainly temporary changes in the Central Nervous System, the benefits in quality of life justify its use. It is vital that healthcare professionals stay informed and clearly communicate the risks and benefits of ECT while continuing to explore and develop new approaches to treating complex and refractory psychiatric conditions.

Keywords: Electroconvulsive therapy, Major Depressive Disorder, Refractory.

INTRODUCTION

Depression is the most common and disabling psychiatric disorder globally, with an annual prevalence of major depressive disorder of around 6.6% and a lifetime incidence of 16.2% (Abe et al., 2024; Wade et al., 2020). Despite its significant clinical relevance, 44% of patients do not respond to two successive antidepressant treatments (Guo et al., 2023; Espinoza & Kellner, 2022).

To reinforce the high incidence of so-called treatment-resistant depression, in which the patient has already had at least two depressive episodes, moderate or severe, and does not respond satisfactorily to treatment, after trying two antidepressants, from different classes. This condition highlights the need for effective therapeutic alternatives such as electroconvulsive (ECT). In this context, ECT has been widely used as an effective alternative in cases resistant to conventional treatment. Recent studies confirm the rapid effectiveness of ECT in producing antidepressant and anti-suicidal responses, in addition to reducing readmission rates, contributing significantly to patients' quality of life (Spaans et al., 2015; Charles H. Kellner et al., 2005; Slade et al., 2017).

According to Hsieh, 2023, developed in 1938, even before modern antidepressant drugs, The ECT remains the most efficient and safe neurostimulation method for the treatment of resistant depressive disorders. Although it is a beneficial procedure, there are controversies regarding its adverse effects, which can vary from positive to negative on an individual basis depending on the severity of the patient's condition (Sellevåg et al., 2023). ECT is particularly indicated for patients with persistent suicidal ideation, severe weight loss, malnutrition or dehydration due to food and water refusal, catatonia, depression with psychotic features and a previous positive response to ECT (Hsieh, 2023).

Even though it is the oldest neurostimulation procedure, studies on ECT face several limitations, such as the influence of the patient's age, severity of depression, comorbidities, and lack of data on post-treatment, including the speed and quality of remission, symptoms and response to treatment (Su et al., 2023). ECT was the first effective and safe non-pharmacological treatment for the management of major depressive disorder, with response rates of 74.2% and remission rates greater than 50% (Su et al., 2023; De Schuyteneer et al., 2023). Studies show that, two years after the procedure, patients experience significant improvements in both their psychological and physical quality of life (Lex et al., 2021). The present study aims to evaluate the efficacy, safety and impact on quality of life of electroconvulsive therapy (ECT) in patients with depression, especially those resistant to other treatments, providing an evidence base for its use in clinical practice.

METHODOLOGY

The bibliographic review developed based on the PVO strategy, which includes three main components: Population or research problem (P), Variables of interest (V) and Expected outcome (O). The guiding research question was: "How effective is electroconvulsive therapy (ECT) and how does it impact the quality of life of patients with treatment-resistant depression?"

The searches were carried out in the PubMed - MEDLINE (Medical Literature Analysis and Retrieval System Online) database, using the search terms "Electroconvulsive Therapy", "ECT" and "Depression". These terms were combined with the Boolean operators "AND" or "OR", resulting in the search strategy: ((Electroconvulsive Therapy) OR (ECT)) AND (Depression). The initial search identified 1,454 articles. The established inclusion criteria were: articles in English, published

between 2019 and 2024, that addressed topics of interest for research, including review-type studies, meta-analysis, clinical trials and observational studies available in full. The exclusion criteria applied were: duplicate articles, abstracts, studies that did not directly address the research question or that did not meet the other inclusion criteria. After applying the inclusion and exclusion criteria, 19 articles were selected to form the study's evidence base.

DISCUSSION

Some studies highlight that many patients with Major Depressive Disorder (MDD) are inadequately treated, which includes insufficient doses and duration of treatment. Treatment-resistant depression (TRD) has become a significant epidemiological concern, notably with the prolonged use of antidepressants, with ECT appearing in this scenario (Guo et al., 2023).

Historically, ECT involved the administration of large amounts of electrical charge, often without adequate anesthesia, resulting in severe side effects such as memory loss and brain damage. However, modern ECT is considered a safe treatment with minimal side effects such as transient headache and confusion without causing brain damage or permanent memory loss (Han et al., 2023; Does et al., 2023).

The ECT demonstrates short-term antidepressant response and anti-suicidal effects and is more cost-effective compared with pharmacotherapy and psychotherapy for treatment-resistant depression. Still, the mechanisms of action of ECT, although well characterized in neurobiological terms, remain partially obscure. Proposed hypotheses include neuroendocrine theory, neuroplasticity theory and the connectivity redefinition hypothesis, with ECT temporarily enhancing neuroplasticity and favoring the

reconnection of neuronal circuits (Abe et al., 2024).

Currently, ECT is a medical procedure performed under general anesthesia that uses electrical currents to induce brief seizures in the brain. Widely used to treat psychiatric disorders, especially severe or treatment-resistant major depressive disorder (MDD), ECT shows efficacy in both rapid antidepressant and anti-suicidal effects, significantly contributing to reducing hospital readmission rates (Han et al., 2023; Abe et al., 2024).

However, it is associated with several adverse effects, including basal ganglia white matter hyperintensities and cerebral white matter hyperintensities, medial temporal atrophy, cingulate isthmus thickness asymmetry, and a wide range of gray matter abnormalities (Levy et al., 2019). Several findings underscore the importance of continued research to clarify its clinical implications. Studies indicate that ECT can induce significant changes in brain activity, resulting in temporary disorientation and cognitive side effects, while simultaneously promoting a temporary increase in neuroplasticity. This increase facilitates the reorganization of neuronal connections, allowing the brain to adapt and restructure its neural networks, which is fundamental for the treatment of psychiatric conditions (Abe et al., 2023).

Loef et al. (2024) and Guo et al. (2023) discuss concerns about transient cognitive side effects, such as fear of memory impairment, which may lead to refusal or discontinuation of treatment. However, the Electroconvulsive Therapy Cognitive Assessment (ECCA) is identified as a more sensitive and specific method than MOCA (Montreal Cognitive Assessment Scale) for assessing post-ECT cognitive dysfunction (Guo et al., 2023). ECT positively influences biomarkers related to neuroplasticity and inflammation, and

can induce neurogenesis, synaptogenesis, angiogenesis and expression of neurotrophic factors in brain regions involved in mood regulation, memory formation and executive functions (Han et al., 2023)

Studies indicate that ECT is superior to pharmacotherapy in improving MDD symptoms, being considered a potent acute treatment option and a first-line treatment modality according to recent global clinical guidelines (Guo et al., 2023). Levy et al. (2019) point out that ECT is the most effective treatment option for resistant depression, with response rates greater than 50% to 60% and an effectiveness 3 to 6 times greater than conventional medications. It is recommended as first-line treatment in specific clinical situations, such as melancholic, catatonic or psychotic characteristics.

Although highly effective, about one-third of patients do not respond or respond poorly to ECT. Factors such as psychotic symptoms, long periods of depression, failures in initial medical treatment, suicidal ideation and coexisting personality disorders, in addition to the use of benzodiazepines and antiepileptics, are considered to influence the results of ECT (Ren et al., 2024; Brus et al., 2023).

Finally, a recent meta-analysis using the Medical Outcomes Study Short Form 36 (SF-36) showed that ECT results in improvements in several domains of health-related quality of life shortly after treatment, highlighting its effectiveness in well-being, general fitness and mental processing skills in patients with severe MDD (Lex et al., 2021; Schuyteneer et al., 2023).

Furthermore, recent research reveals that ECT has notable effects on brain volumes, encompassing several regions beyond the hippocampus, such as the amygdala, with statistically significant volumetric changes found throughout much of the brain. These effects are most pronounced in the amygdala

and hippocampus, suggesting regional variation in neuroplasticity mechanisms, with the medial temporal lobe being particularly sensitive to the influence of electrical stimulation (Ousdal et al., 2022). According to high-powered neuroimaging studies, widespread anatomical brain abnormalities and significant functional changes were verified in patients with MDD, identifying an extensive cortico-limbic network involving the hippocampus, amygdala, and several cortices, whose impairment is closely linked to severity and the onset of depression (Levy et al., 2019).

The most recent studies, including those from the Global ECT-MRI Research Collaboration (GEMRIC), show that the effect of ECT on brain volumes is observed in well-distributed regions, with significant increases in the amygdala and dentate gyrus of the hippocampus. These results propose regional variability in neuroplasticity processes, where the medial temporal lobe may be the brain region with greater sensitivity to electrical stimulation and/or seizures induced by ECT (Abe et al., 2024).

Finally, studies by Abe et al. (2024) suggest that hippocampal neurogenesis is directly related to the antidepressant effects of ECT, although further investigation is still needed to fully understand whether neurogenesis increases in the human brain after ECT (Lex et al., 2021; Schuyteneer et al., 2023).

Side effects of ECT, such as amnesia, headaches, and nausea, are frequently reported, although they are usually mild and temporary. In cases of serious adverse events, such as profound amnesia or episodes of delirium, it may be necessary to interrupt treatment, highlighting the need for careful monitoring to ensure patient safety and well-being (Andrade et al., 2016).

FINAL CONSIDERATIONS

Throughout this study, a wide range of recent articles were used to elucidate the impact of Electroconvulsive Therapy (ECT) on treatment effectiveness and quality of life for patients with treatment-resistant depression. The data suggest that, especially for patients with persistent suicidal ideation and severe or resistant Major Depressive Disorder, ECT stands out as an effective method for controlling suicidal symptoms and short-term antidepressant effects, proving to be more cost-effective when compared conventional medications and psychotherapy.

However, despite advances in care and treatment safety, adverse effects associated with the use of ECT persist, generally involving structural changes in the Central Nervous System, such as medial temporal

atrophy and changes in gray matter. Although these effects are concerning, most side effects, such as headache, nausea, and amnesia, are self-limited and short-lived. The benefits observed in the quality of life of patients who responded positively to ECT reinforce the relevance of this treatment, significantly improving general well-being and mental processing capacity. These results reiterate the need to continue research and development of treatments for refractory psychiatric illnesses, despite the stigmas associated with the use of ECT. Therefore, it is crucial that healthcare professionals stay up to date with the latest research so they can offer the best treatment options. It is also essential to adequately inform patients about the benefits and risks of ECT, demystifying prejudices and promoting a deeper understanding of its therapeutic value.

REFERENCES

ABE, Yoshifumi, et al. Neurobiological mechanisms of electroconvulsive therapy for depression: Insights into hippocampal volumetric increases from clinical and preclinical studies. *Journal of Neurochemistry*, 2024.

ARGYELAN, Miklos, et al. Electroconvulsive therapy-induced volumetric brain changes converge on a common causal circuit in depression. *Molecular Psychiatry*, 2023.

BRUS, Ole, et al. Long-Term Effect of Maintenance Electroconvulsive Therapy in Patients With Depression-Data From a Small Randomized Controlled Trial. *The Journal of ECT*, 2023.

DOES, Yuri van der, et al. Outcome prediction of electroconvulsive therapy for depression. *Psychiatry Research*, v.326, 2023.

ERCHINGER, Vera J, et al. Electroconvulsive therapy triggers a reversible decrease in brain N-acetylaspartate. *Front Psychiatry*, v.14, 2023.

GUO, Qinghua, et al. Long-term cognitive effects of electroconvulsive therapy in major depressive disorder: A systematic review and meta-analysis. *Psychiatry Research*, v.331, 2024.

HAN, Yan-Ke, et al. Treatment outcomes and cognitive function following electroconvulsive therapy in patients with severe depression. *World Journal of Psychiatry*, v.13, n.11, p.949-957, 2023.

HSIEH, Ming H. Electroconvulsive therapy for treatment-resistant depression. *Treatment-Resistant Depression Part B*, v.281, p. 69-90, 2023.

LEVY, Anna, et al. Neuroimaging Biomarkers at Baseline Predict Electroconvulsive Therapy Overall Clinical Responses in Depression A Systematic Review. *Journal of ECT*, vol. 35, no. 2, 2019.

LEX, Heidemarie, et al. Long-term quality of life in treatment-resistant depression after electroconvulsive therapy. *Journal of affective disorders*, vol. 291, p. 135-139, 2021.

LOEF, Dore, et al. Electroconvulsive therapy is associated with increased immunoreactivity of neuroplasticity markers in the hippocampus of depressed patients. *Translational Psychiatry*, v.13, n.1, 2023.

LOEF, Dore, et al. Pre-treatment predictors of cognitive side-effects after treatment with electroconvulsive therapy in patients with depression: A multicenter study. *Journal of affective disorders*, vol. 349, p. 321-331, 2024.

REN, Hao, et al. Electroconvulsive therapy for adolescents with severe depressive episode and suicidality: retrospective comparison between responders and non-responders. *Child and Adolescent Psychiatry and Mental Health*, v.18, 2024.

SCHUYTENEER, Emma De, et al. Electroconvulsive therapy improves somatic symptoms before mood in patients with depression: A directed network analysis. *Brain Stimulation*, vol. 16, no. 6, p. 1677-1683, 2023.

SELLEVÅG, Kjersti, et al. Unmasking patient diversity: Exploring cognitive and antidepressive effects of electroconvulsive therapy. *European Psychiatry*, vol. 67, no. 1 and. 12, p. 1-9, 2024.

SU, Liang, et al. Predictors of Electroconvulsive Therapy Outcome in Major Depressive Disorder. *International Journal of Neuropsychopharmacology*, v.26, n.1, p. 53–60, 2023.

WADE, Benjamin SC, et al. Depressive symptom dimensions in treatment-resistant major depression and their modulation with electroconvulsive therapy. *The journal of ECT*, v. 36, no. 2, p. 123-129, 2020.

YU, Xiaohui, et al. Molecular basis underlying changes of brain entropy and functional connectivity in major depressive disorders after electroconvulsive therapy. *CNS Neuroscience & Therapeutics*, v.30, n.3, 2024.