Cortisol Level as a Predictor for Cognitive Impairment Induced by Brain Synchronization Therapy in Patients with Severe Depression

Thesis

Submitted for partial fulfillment of Master's Degree
in Neuropsychiatry

Presented by

Sara Abd Elkader Elawady
(MB, BCh)

Under supervision of

Prof. Mona Mansour mohamed
Professor of Psychiatry
Faculty of Medicine - Ain Shams University

Prof. Heba Ibrahim Essawy
Professor of Psychiatry
Faculty of Medicine – Ain Shams University

Dr. Nesreen Mohamed Mohsen
Lecturer of Psychiatry
Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
2015

سورة البقرة الآية: ٣٢


وأنزل الله عليك
الكتاب والحكمة
وعلَّمَكَ مَا لَمْ تَكُن
تَعْلَمُ وكَانَ فَضْلُ
اللَّهِ عَلَيْكَ عَظِيماً
صدق الله العظيم
سورة النساء الآية (١١٣)

Acknowledgments

First and foremost, I feel always indebted to ***Allah*** *the Most Beneficent and Merciful.*

I wish to express my deepest gratitude and thanks to **Prof. Mona Mansour Mohamed,** *Professor of Psychiatry, Faculty of Medicine - Ain Shams University, for her constructive criticism, unlimited help and giving me the privilege to work under her supervision.*

My most sincere gratitude is also extended to **Prof. Heba Ibrahim Essawy,** *Professor of Psychiatry, Faculty of Medicine – Ain Shams University, for her enthusiastic help, continuous supervision, guidance and support throughout this work.*

Words fail to express my appreciation to **Dr. Nesreen Mohamed Mohsen,** *Lecturer of Psychiatry, Faculty of Medicine – Ain Shams University, for her enthusiastic help, continuous supervision, guidance and support throughout this work.*

Last but not least, I can't forget to thank all members of my Family, especially my ***Parents****, for pushing me forward in every step in the journey of my life.*

Candidate

Sara Abd Elkader Elawady

List of Contents

List of Tables

List of Figures

Introduction

Electroconvulsive therapy, commonly called ECT, was developed in 1938. During the period following its introduction, ECT was found effective for treating multiple psychiatric illnesses, especially depression. With the development of psychiatric medications and stigma associated with ECT in the 1960's, the use of ECT treatment declined. The use of ECT has increased since the 1970's because of improved treatment delivery methods, increased safety and comfort measures, and enhanced anesthesia management. ECT is the most effective treatment for severe mental illness and is an extremely safe treatment ***(Sadock, 2007).***

ECT is most commonly used to treat patients with severe depression and patients who are severely agitated, delusional, suicidal, not eating or drinking, as well as those who suffer from catatonia ***(Schmidt et al., 2008)***.

The key risks of ECT are organized into three different main categories.

The first category, medical and physical risks includes adverse reaction to anesthetic agents and neuromuscular blocking agents, alterations in blood pressure, cardiovascular complications, death, dental and oral trauma, pain and

discomfort, physical trauma, prolonged seizures, pulmonary complications, skin burns, and stroke. The other two main categories include cognitive and memory dysfunction, and device malfunction.

Death is a rare but severe outcome of ECT treatment. It is a result of various complications of ECT such as reactions to anesthesia, cardiovascular complications, pulmonary complications, or stroke. Potential mitigating factors include those proposed for each of these key risks.

Another area of key risk associated with ECT use is cognitive and memory dysfunction. The FDA review found that ECT is likely associated with immediate general cognitive and memory dysfunction. Cognitive dysfunction is represented by disorientation. Disorientation appears to be transient and generally resolves in a matter of minutes after the procedure ***(Hinkelmann et al., 2009)***.

Memory dysfunction in general largely resolves in the days to weeks after the completion of a course of ECT. However, in certain domains, particularly in anterograde verbal memory and retrograde autobiographical memory, deficits may be more prominent and/or persistent. While anterograde memory deficits may resolve in the days to weeks after ECT, autobiographical memory deficits may be more persistent. Per Dr. Como's and Dr. Krulewitch's

presentations, at one to two weeks post-ECT, there is evidence that suggests that autobiographical memory performance is approximately 76 to 77 percent of baseline performance for right unilateral treatment and 58 to 67 percent for bilateral treatment. Limited evidence suggests that ECT memory deficits may approach baseline at six months.

In terms of mitigating factors, studies have demonstrated that potential mitigating factors for reducing the occurrence and risk of memory and cognitive adverse events might include exclusive use of square wave, direct current, brief pulse stimulus, use of ultrabrief pulse, 0.3 milliseconds stimulus, exclusive use of unilateral nondominant electrode placement, use of bifrontal electrode placement, or limiting ECT administration to twice per week ***(Hinkelmann et al., 2009)***.

When the onset of memory and cognitive function are noted during the course of ECT, other mitigating strategies may include switching from bilateral to unilateral treatments, decreasing energy dose or employing ultrabrief pulse stimulus. Identification of safe stimulation parameters in the device labeling to inform practitioners of safe device use may serve as an additional mitigating factor.

The neurocognitive side effects associated with ECT have been an area of interest for researchers and clinicians since the first treatments were administered decades ago, and many studies have assessed the neurocognitive effects of this treatment, taking into consideration the severity of psychiatric illness and various cognitive domains, with a central focus on memory functions. Impairment in cognitive performance has been differentially associated with severity of depression. Cognitive slowing is common in elderly patients with depression, and this is a factor that researchers must consider when reviewing the effects of ECT on neurocognitive performance in these patients. In addition, several cognitive deficits are often associated with late-life depression, including decreased processing speed, poor verbal memory, executive dysfunction, and decreased concentration.

Although at present there is no evidence that ECT, as currently administered, causes brain damage, repeated high-dose electroconvulsive shock has been found to cause neuronal death in the hippocampi of animals. Thus, Thomas Neylan (University of California) and colleagues suggest that ECT-induced cognitive impairment may be related to reversible neuronal injury that is potentiated by glucocorticoids.

Aim of the Work

To study the relation between basal salivary cortisol level and cognitive impairment induced by ECT in patients with severe depression.

Electroconvulsive Therapy

Electroconvulsive therapy (ECT) has been demonstrated to be an effective and safe treatment for many psychiatric disorders. The use of ECT still generates significant controversy. ECT has been viewed as harmful by the general public, psychiatric patients, and mental health professionals ***(Ross, 2006)***.

ECT has also been perceived as a form of violence against women ***(Burstow, 2006)***. It has been negatively portrayed in movies such as *One Flew over the Cuckoo's Nest, House on Haunted Hill,* and *Requiem for a Dream* ***(McDonald et al., 2001).***

Despite such debate, ECT is used in the United States and endorsed by the American Psychiatric Association **(American Psychiatric Association, 2009)**. Approximately 100,000 patients annually receive ECT in the United States ***(Sadock, 2007).***

Professional associations in Austria, Canada, Australia, Denmark, Netherlands, Germany, and India have offered professional guidelines for its use ***(Otto et al., 2004)***.

Electroconvulsive therapy uses an electric current to cause a seizure in the brain and is one of the fastest ways to ease

severe symptoms. It is usually a last resort when a patient does not improve with medication or psychotherapy.

History

In the 1500s, the Swiss physician Paracelsus (Auroleus Phillipus Theostratus Bombastus von Hohenheim) induced seizures by administering camphor by mouth to treat psychiatric illness. The first published report of the use of seizure induction to treat mania using camphor was in 1785.

In 1934, the Hungarian neuropathologist Ladislas Joseph von Meduna began the modern era of convulsive therapy by using intramuscular injection of camphor (soon replaced with pentylenetetrazol) to treat catatonic schizophrenia.

In 1938, Italian psychiatrist Lucio Bini and neurologist Ugo Cerletti performed the first electrical induction of a series of seizures in a catatonic patient and produced a successful treatment response. One year later, ECT was introduced to the United States.

Lack of adequate anesthesia or muscle relaxation during ECT led to fractures and dislocations, and insufficient knowledge about the dose parameters of electrical stimulation led to more severe cognitive adverse effects. In 1940, curare was developed for use as a muscle relaxant