Rev Psiquiatr Salud Ment (Barc.). 2018;11(1):36-47

Revista de Psiquiatría y Salud Mental

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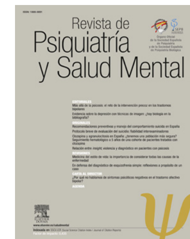

REVIEW ARTICLE

Stimulus characteristics in electroconvulsive therapy. A pragmatic review[☆]

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Received 2 April 2016; accepted 30 June 2016
Available online 28 February 2018

KEYWORDS
Electroconvulsive therapy;
Charge;
Current amplitude;
Frequency;
Pulse width

Abstract The process of normalization electroconvulsive therapy (ECT) requires, among other actions, disseminating the latest information on this technique. One of the most complex aspects is the electrical stimulus, whose knowledge should be spread and put into practice.

In this paper, we review the available information about frequency and number of ECT sessions, and efficacy of each electrode placement. We also present two approaches to determine the ECT charge: stimulus titration versus age-based method; and the limitations of the summary metrics of charge, being necessary to expand our knowledge of the parameters that configure the stimulus: duration, current amplitude frequency and pulse width.
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PALABRAS CLAVE
Terapia electroconvulsiva;
Carga;
Intensidad;
Frecuencia;
Amplitud de pulso

Características del estímulo en terapia electroconvulsiva. Una revisión pragmática

Resumen El proceso de normalización y dignificación de la terapia electroconvulsiva (TEC) requiere, entre otras acciones, la difusión de la información más actualizada sobre esta técnica. Uno de los aspectos que ha alcanzado mayor sofisticación es el relacionado con el estímulo eléctrico, un conocimiento que es preciso consensuar, extender y llevar a nuestra práctica.

Se revisa en este trabajo la información disponible sobre frecuencia y número de sesiones de TEC, y la utilidad de las distintas localizaciones de electrodos; se describen y valoran los métodos de cálculo de la carga a emplear, titulación o cálculo directo con base en la edad, y se destaca la insuficiencia de las medidas globales de magnitud del estímulo, siendo preciso ampliar nuestro conocimiento sobre los parámetros que configuran la carga: tiempo, intensidad, frecuencia y amplitud de pulso.
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☆ Please cite this article as: Sanz-Fuentenebro FJ. Características del estímulo en terapia electroconvulsiva. Una revisión pragmática. Rev Psiquiatr Salud Ment (Barc.). 2018;11:36-47.

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Introduction

Electroconvulsive therapy (ECT) is a particularly effective treatment in the case of clearly defined indications,[1] still surrounded by a certain degree of stigma in our setting, and negatively affected by inefficient resource management, unequal access for patients, significant variability in rates and standards of application, and insufficient training of professionals.[2,3] Several initiatives linked to the Spanish Society of Biological Psychiatry (SEPB in its Spanish acronym) have posed the need to dignify and standardize this technique in our setting.[4] The greater amount of research on ECT, the dissemination of findings, and the drafting of guidelines and consensuses (such as the recently published Guide to Best Clinical Practice on Electroconvulsive Therapy)[5] are at the crux of these actions. Along these lines of further researching and disseminating information, the following review addresses aspects related to the technique of application, which are included in the guides as general guidelines[6] but are rarely considered in clinical practice. The most up-to-date information is reviewed on the frequency and number of sessions, position of the electrodes and characteristics of the electrical stimulus, setting out the different opinions on this, and summarizing with subtle views, following the author's criteria. In general, results obtained with samples were collected from depressed patients, specifying the cases in which other pathologies were treated. In addition, we shall refer in principle to the results of treatments in the acute phase, indicating the data on continuation/maintenance if applicable.

Methodology

The search results for articles published between 1965 and 2016 on the subject in Medline, Psychinfo, Embase and Cochrane originals have been thoroughly reviewed, as well as the main guides on the subject, including articles in English, French and Spanish, from original research texts to published cases, recommendations, consensuses or narrative reviews. Particularly considered were experimental studies, especially meta-analyses, series of studies on topics by defined groups, and regularly updated guides. The basic search terms were: ''*Electroconvulsive Therapy Instrumentation, Methods, Standards, Therapeutic use, Electrode placement, Unilateral, Stimulus intensities, Convulsion duration, Pulse, Ultra-brief, Brief, Suprathreshold, Threshold, Titration, Electrical stimulus, Duration, Current amplitude, Frequency, Pulse width*''. The search was completed with a manual and retrospective review of the studies selected, using a final total of 160 different references of particular interest.

Results

As with many other empirical medical treatments, the mechanism of action of ECT is not completely known, despite the enormous advances over the last few decades,[7] and the particular insistence with which knowledge of this technique is demanded.[8] What is clearly known is that ECT produces this improvement by provoking a convulsion by means of an electrical stimulus.[9] Historically, crises were achieved through chemical means, an option that Fink continues to defend in order to highlight the role of the crisis as opposed to the way it is produced.[10,11] The objective is a clinically effective crisis, which is associated with a minimum duration, spread across both hemispheres, and an electroencephalographic pattern of a certain quality.[6] This requires an appropriate stimulus: sufficiently powerful to maximize efficacy but not so high that it causes side effects.[12] This risk-benefit balance will be, as in the case of all medical action, the crux of this study. It is necessary to consider the patient's own variables, such as their age, concomitant medication, medical situation, pre-medication, anaesthetic technique, hydration, and O_2 and CO_2 levels. However, in this study we shall focus on the variables of the stimulation which the crisis is provoked with: the number of sessions, the break between them, the position of the electrodes, and the electrical stimulus used; not only considering the total charge but also the electrical parameters that compose it, the handling of which can decisively influence the clinical outcome.[13] Although we shall analyze each aspect separately, the decisions about the technique that will be used with a particular patient at a specific point in time must be taken before the sessions, as a strictly individualized unit, depending on the characteristics of both the particular patient (age, medication, medical and anaesthetic risk, cognitive risk and the urgency of response, etc.). However, it must also be borne in mind that the day-to-day reality of healthcare includes different contexts for application which are not always ideal,[2] as well as various different levels of training of the professionals involved, or the stability and knowledge of the anaesthesia team, which can sometimes lead to one action or another.

Number of sessions

It is not possible to anticipate the number of sessions that will be required during acute treatment of ECT. In general, the treatment is reconsidered after each session, and it is decided to withdraw the treatment when no further improvement has been obtained. The decision to continue results from a balance between individual risk, the seriousness of the patient's condition, and the expectations of improvement. In general, the first sessions are an indicator of the expected response[14]: a 30% decrease in symptoms after the first 6 sessions predicts complete remission.[15] If there is no improvement in the first 4–6 sessions it will be necessary to reconsider the technique used, reviewing the suitability of the crises being obtained and, where appropriate, the position of the electrodes, going from unilateral (UL) to bilateral. If after that there is no improvement, it will be appropriate to rethink the indication.[12] Although most patients improve before 9 sessions,[16] some depressed patients present complete late responses, so it is appropriate to reach 12 sessions if there is a partial initial response.[17,18] In general, a greater number of sessions is needed to obtain maximum improvement in psychotic symptoms (around 12–14 sessions), and fewer in depressive ones (6–12 sessions).

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