A meta-analysis of electroconvulsive therapy efficacy in depression

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CRD summary
This review investigated the effects of electroconvulsive therapy (ECT) on depression. The main results suggested that ECT is better than simulated ECT and some medications. However, flaws in the way in which the studies were analysed might have introduced biases that could influence the results of the review.

Authors' objectives
To perform a meta-analysis of the efficacy of electroconvulsive therapy (ECT) in the treatment of depression. Four main questions were addressed.

Would this meta-analysis replicate the findings of earlier meta-analyses which favoured ECT over other treatments?

Is there evidence for the rapid rate of response to ECT?

Is brief pulse stimulation just as efficacious as sine wave stimulation?

Are there variables that can predict the efficacy of ECT?

Searching
PsycLIT and MEDLINE were searched up to December 2001 for literature in any language; the search terms were reported. Additional articles were identified from the reference lists of relevant reviews and primary studies. Authors were contacted for additional information. Only studies published after 1978 were included.

Study selection
Study designs of evaluations included in the review
No specific inclusion criteria relating to the study design were reported. All the studies included appear to have been randomised controlled trials (RCTs).

Specific interventions included in the review
Studies that compared ECT with another treatment were included in the review. The selected studies evaluated sine wave and brief pulse wave forms of ETC. The control interventions included antidepressant medication (imipramine, paroxetine or undefined), simulated ECT, isoflurane narcotherapy, placebo, sudarshan kriya yoga, rapid rate transcranial magnetic stimulation and cognitive-behavioural therapy.

Participants included in the review
Studies with depressed patients were selected for the review. The mean age in the comparison groups ranged from 36 to 78 years, while the mean proportion of women in each group ranged from 33 to 100%.

Outcomes assessed in the review
Studies using an observer depression rating scale were selected for the review. Details of the specific scales used in each study were not provided.

How were decisions on the relevance of primary studies made?
Two authors selected the studies for inclusion, with any disagreements resolved by consensus.

Assessment of study quality
The assessment of study validity was based on randomisation, double-blinding, and withdrawals or drop-outs, with each
study being given a quality score of 0 to 5 (see Other Publications of Related Interest no.1). One author assessed the validity of the included studies.

Data extraction
Two authors extracted the data from the included studies. Data were extracted on: treatment in the control groups, wave form of ECT stimulus, age, the duration of current illness, and medication treatment failure. Outcome data extracted from each study were the pre and post-treatment mean and standard deviation depression scores in the ECT and control groups. Post-treatment scores after each ECT session were also extracted. If a study compared ECT with more than one control, the data for each control group were extracted separately. If a study divided the population into separate comparisons, the data were also extracted separately. These data were used to calculate the difference in pre- and post-treatment effect size for each comparison of ECT and control. The post-treatment scores after two, three or four ECT sessions were used in the calculation of rapid effect size for the analysis of rate of response.

Methods of synthesis
How were the studies combined?
A meta-analysis using both fixed-effect and random-effects models was used to combine the effect sizes derived from each study, as described by Hedges and Olkin (see Other Publications of Related Interest no.2). Four studies provided more than one effect size.

Publication bias was assessed by constructing a funnel plot of study sample size against effect size (see Other Publications of Related Interest no.3).

How were differences between studies investigated?
Subgroup analyses were conducted according to wave form, control treatment, age, duration of illness, and percentage of participants with medication failure or psychosis. Heterogeneity was assessed using the Q statistic. Differences in effect associated with study quality were explored in a regression plot of quality score against effect size. Differences due to publication status appear to have been deduced from the funnel plot.

Results of the review
Sixteen studies (n=611) were included in the review, from which 20 separate comparisons were included in the analysis.

The overall pooled effect size showed a statistically significant benefit for ECT versus control (20 comparisons: 0.90, 95% confidence interval, CI: 0.52, 1.27). There was statistically significant heterogeneity (Q=73, d.f.=19, P<0.001).

The pooled effect size for rapid response failed to show a significant benefit of ECT over control (11 comparisons: 0.29, 95% CI: -0.16, 0.75). There was statistically significant heterogeneity (Q=31, d.f.=10, P<0.001).

The subgroup analysis indicated no statistically significant difference between sine wave and brief pulse stimulation ETC. It did, however, indicate a statistically significant better response to ECT in studies in which all the patients had psychosis compared with studies in which the patients were without psychosis, or studies in which only a proportion of patients had psychosis.

The authors did not find any clear relationship between effect size and validity score or publication status.

Authors' conclusions
No evidence for a superior speed of action of ECT, or a difference in efficacy between sine wave and brief pulse stimulation, was found. ECT was shown to be superior to medication and simulated ETC. There was some evidence to suggest that psychosis predicted a better response to ETC.

CRD commentary
The review used reasonable inclusion criteria to select studies from an adequate search of two large databases.
augmented with searches of some additional sources. Study validity was assessed using an established scale and investigated as a moderator of effect size. Some details of the included studies were given in the review, but these were very sparse: e.g. there were no individual study details about the participants (other than age), the duration or intensity of the treatment, and the length of follow-up.

The studies were combined using an established method of meta-analysis. However, the studies differed from one another in terms of control interventions, outcomes and other important aspects. This was reflected in the highly significant statistical heterogeneity observed for most of the pooled comparisons. In addition, because some of the included studies contributed more than one effect size to the overall pooled effect size, the control group patients may have been double-counted in the meta-analysis, which might have biased the findings. Though the authors' overall conclusion that ECT was efficacious seems reasonable, their more specific conclusions were based on comparisons of subgroups of trials rather than comparisons within randomised trials and, therefore, need to be interpreted with caution.

**Implications of the review for practice and research**
The authors did not state any implications for practice or further research.

**Bibliographic details**

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**Other publications of related interest**

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.