Electro-Convulsive Therapy: Update 2008

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Electro-Convulsive Therapy Goals
By the end of the seminar, a participant should be able to:
• Describe major indications and contraindications
• Describe efficacy
• Be aware of the possible adverse reactions
• Be aware of special consent requirements
• Know how a general outline of the procedure

Outline
• Major indications and contraindications
• Efficacy
• Legal requirements
• Anesthesia issues
• Adverse reactions
• Mechanism of action
• General outline of the procedure

Ambulatory Surgery Center at UCSF
Outline

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Electro-Convulsive Therapy Indications

**Most Common:**
Major Depressive Episode (of either unipolar or bipolar disorder)

**Occasional:**
Mania, schizophrenia

**Rare:**
Delirium, Parkinson’s disease, neuroleptic malignant syndrome, intractable epilepsy

Electro-Convulsive Therapy Indications

**Generally preferred in the following situations:**
- Treatment-resistance or failure
- Need for rapid, definitive treatment: psychosis, catatonia, inability to eat, severe weight loss, severe suicidal ideation
- Patient preference
- High medical complexity: cachexia, inability to tolerate medication trials

Electro-Convulsive Therapy Contraindications

**No absolute contraindications**

Medical conditions associated with increased risk:
- **intracranial:** space occupying cerebral lesion, recent intracerebral hemorrhage, unstable vascular aneurysm or malformation, conditions causing increased intracerebral pressure
- **other:** recent myocardial infarction, pheochromocytoma, high anesthetic risk
PACU Reception and Waiting Room

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Electro-Convulsive Therapy

Efficacy

• Supported by ECT vs. sham ECT studies, ECT vs. medication studies
• Compares favorably with medication treatment of depression
• Efficacy most clear in depression

Most effective therapy available for severe depression

71% response rate as first treatment
51% response rate in medication refractory population
(Medical Research Council, Great Britain, 1965)

86% response rate after inadequate med trial
51% response rate after adequate med trial
(Prudic et al., USA, 1990)
ECT vs. Pharmacotherapy


Recent Efficacy Rates

<table>
<thead>
<tr>
<th>Study</th>
<th>Remission rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia (1)</td>
<td>55% (159/290)</td>
</tr>
<tr>
<td>CORE (2)</td>
<td>86% (341/394)</td>
</tr>
<tr>
<td>STAR*D (3)</td>
<td>67% (after 4 med trials)</td>
</tr>
<tr>
<td></td>
<td>(43% incl. relapses)</td>
</tr>
</tbody>
</table>


Factors Associated with Efficacy:

- Catatonic features
- Melancholic features
- Psychotic features (e.g., delusional depression)
- History of prior response to ECT
- (Suicidal ideation)

Factors Associated with Variable Response:

- Chronicity (Dysthymia)
- Medication refractory
- Relative lack of neurovegetative signs
- Comorbid substance abuse
- Comorbid personality disorder
Efficacy of ECT: Relationship between Outcome and Axis II Disorder

<table>
<thead>
<tr>
<th>(+) Axis II</th>
<th>(-) Axis II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td>51%</td>
</tr>
<tr>
<td>Remit</td>
<td>32%</td>
</tr>
<tr>
<td>Remit$_r$</td>
<td>18%</td>
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</tbody>
</table>


Relationship between Outcome and Axis II Disorder

(Feske et al. Am J Psychiatry 2004; 161:2073–2080)

<table>
<thead>
<tr>
<th>Axis II Disorder</th>
<th>Patients with Borderline Personality Disorder (n=20)</th>
<th>Patients with Other Personality Disorders (n=42)</th>
<th>Patients with No Personality Disorder (n=77)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean HAM-D before ECT</td>
<td>Mean HAM-D after ECT</td>
<td>Mean HAM-D before ECT</td>
</tr>
<tr>
<td></td>
<td>38.4</td>
<td>10.3</td>
<td>37.7</td>
</tr>
</tbody>
</table>

Remission rate:

Pre-ECT HAM-D

38.4 37.7 35.8

Post-ECT HAM-D

20.3 12.1 10.7

Remission rate

20.0% (4) 52.4% (22) 65.3% (49)

*p = 0.25, **p = 0.001

Electro-Convulsive Therapy

Other References for Efficacy

Brandon S et al. Electroconvulsive therapy results in depressive illness from the Leicestershire trial. BMJ, 1984; 288:22-25


The Post-Anesthesia Care Unit (PACU)

PACU Recovery Nurses

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Electro-Convulsive Therapy Consent – legal issues

- Detailed explanation of procedure must occur 24 hours before consent form can be signed
- Two components: patient consent plus informed consent review by another Board-certified psychiatrist (every thirty (30) days)
- Family must be notified, or notification of family must be specifically rejected by the patient
- ECT is banned for minors less than 12
Anesthesia for ECT

Table 1. Effects of IV Anesthetic and Cardiovascular Drugs on the Execution of ECT-Mediated Seizure Activity (relative to methohexital or saline, respectively)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Increased</th>
<th>No change</th>
<th>Decreased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthetic drugs</td>
<td>Methohexital 50-60%</td>
<td>Methohexital 50-60%</td>
<td>Methohexital 50-60%</td>
</tr>
<tr>
<td></td>
<td>Propofol 30-40%</td>
<td>Propofol 30-40%</td>
<td>Propofol 30-40%</td>
</tr>
<tr>
<td>Cardiovascular drugs</td>
<td>Succinylcholine 20-30%</td>
<td>Succinylcholine 20-30%</td>
<td>Succinylcholine 20-30%</td>
</tr>
</tbody>
</table>

Other medications:
- Labetolol, esmolol
- Toradol, fentanyl
- Midazolam

Frequently used medications for ECT

Anesthetics
- Methohexital
- Etomidate, propofol

Anesthetics
- Succinylcholine

Other
- Labetolol, esmolol
- Toradol, fentanyl
- Midazolam
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Electro-Convulsive Therapy

Adverse Effects

1. headache
2. muscle aches
3. post-treatment confusion
4. memory impairment
Electro-Convulsive Therapy

Adverse Effects

Factors affecting post-ictal confusion:
Stimulus waveform, Stimulus intensity, Electrode placement, Number and frequency of treatments, Patient age, Pre-existing cognitive dysfunction

Patient can also present with “spaciness” that lasts for several days to weeks. For this reason, patients must be carefully monitored during the course of ECT.

Electro-Convulsive Therapy

Adverse Effects -- Memory impairment (amnesia)

Research on memory impairment spans three broad eras:
1) Introduction of sine-wave, bitemporal ECT (1938) until the introduction of right unilateral ECT (1958)
2) Adoption of brief pulse ECT (1958-ca.1980)
3) 1980’s until now

Studies from eras 1) and 2) mostly of historical interest only.

Electro-Convulsive Therapy

Adverse Effects -- Memory impairment (amnesia)

Types of memory:
retrograde vs. anterograde
long-term vs. short-term
personal (autobiographical) vs. impersonal (public events)
episodic vs. semantic
objective vs. subjective: metamemory

Traditionally, ECT thought to cause greatest deficits in autobiographical memory

Electro-Convulsive Therapy

Adverse Effects -- Memory impairment (amnesia)

Research on the effect of ECT on memory is complex:
Depression frequently presents with associated cognitive difficulties (pseudodementia)
Medications can also cause memory problems
Normal forgetting must be factored in to studies
Patient selection may also have influence (ie, patients with depression may have a higher incidence of dementia)
Electro-Convulsive Therapy

Adverse Effects -- Memory impairment (amnesia)

Ribot’s Law – amnesia is greater for recent compared with distantly remote events, and for less salient events. The amnestic effects of ECT are greater and more persistent for knowledge about the world (impersonal memory) compared with knowledge about the self (personal memory). Bilateral lead placement causes greater cognitive problems than unilateral.


Lisanby et al. The effects of electroconvulsive therapy on memory of autobiographical and public events. Arch Gen Psychiatry 1999; 56: 380-386.

Electro-Convulsive Therapy

Adverse Effects -- Subjective memory impairment

Majority of patients describe improved memory and cognitive functioning after treatment (correlates with improved mood)

Persistent memory deficits beyond six months are rare, but do occur

Cost/benefit analysis generally favors ECT (but must be made on a case-by-case basis)

We generally initiate treatment with right unilateral lead placement and then titrate to 500% above seizure threshold.

Results after six months

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Electro-Convulsive Therapy
Mechanism of Action

Neurotransmitter Hypothesis
Many substances released during, and immediately after, ECT treatment: somatostatin, neuropeptide Y, corticotropin-releasing factor, endothelin, oxytocin, vasopressin, endorphins, TSH, serotonin, prolactin, but not GABA
Prolactin release (10-50 increase at 10-20 min post-ECT, returns to baseline in 2 hours is associated with antidepressant efficacy (most likely as a marker, see below)
However, no evidence demonstrating causality

Anticonvulsant Hypothesis:
Postictal suppression of EEG correlated to antidepressant response
However, patients whose seizure thresholds increase over the course of ECT tend to do less well
In addition, seizures alone are necessary, but not sufficient to account to antidepressant action of ECT (as demonstrated in low-dose unilateral ECT studies)

Seizure Generalization Hypothesis
Antidepressant response dependent upon the efficiency of seizure generalization throughout the brain
EEG amplitude, EEG coherence, cardiovascular response, duration of seizure, amount of prolactin released predict antidepressant response

"diencephalic model": diencephalon involved for therapeutic effect (bitemporal lead placement more effective than unilateral lead placement)
Initiation of seizures in the prefrontal area are most likely to induce antidepressant activity

Electro-Convulsive Therapy
Mechanism of Action (continued)

Anatomico-ictal theory
Basically, a combination of the diencephalic model and the prefrontal model
ECT-induced seizures will have the most antidepressant effect when the seizure is initiated in the prefrontal regions of the brain and then spread maximally through the cortex and subcortex, and especially the diencephalon

“Part of our problem in knowing more about how ECT works is that we don’t know the cause of depression exactly...If we don’t know the cause of the disorder, it’s hard to know what the treatment is doing.”

--from Shock: The Healing Power of Electroconvulsive Therapy

What is the best model for antidepressant activity?
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Electro-Convulsive Therapy Overview of treatment course

– Pretreatment evaluation for general anesthesia:
  H+P, labs, EKG
– Certain medications must be stopped or decreased in advance (eg, benzodiazepines, anticonvulsants, lithium).
– Patients usu. take am antihypertensives with small sip of water
– Generally requires 6-12 initial treatments given on a 3x/week basis
– High rate of relapse if no treatment following
– Continuation or maintenance treatment is often required or a patient is re-started on medications after initial response

Electro-Convulsive Therapy Overview of a single treatment

1) Pt is NPO after Midnight (except meds with small sips of water)
2) In the morning, intravenous line is started.
3) Patient is initially anesthetized with methohexital i.v.
4) Succinylcholine i.v. is then given as muscle relaxant.
5) Stimulus is given, patient has a seizure, which lasts 30-120 sec.
6) Patient awakens after 5-10 minutes, is taken to the PACU.
7) After approximately one hour (or less), patient is fully recovered.

• N.B. Picture is backwards.
Thymatron IV

Electro-Convulsive Therapy Summary

Electroconvulsive therapy has comparable or superior efficacy compared with other treatments for depression, Co-morbid Axis II disorders, substance abuse, and chronicity predict less efficacy (but not none).

Possible adverse reactions include headache, nausea, post-treatment confusion, and memory impairment.

Electro-Convulsive Therapy Summary

Informed consent is regulated by State law and requires documentation by two Board-certified psychiatrists or neurologists every 30 days.

The procedure is brief, requires general anesthesia and usually an inpatient hospitalization. A typical course of ECT is 6-12 treatments.

ECT has a high rate of relapse without continuation pharmacotherapy (combination lithium and nortriptyline has been best studied).
Electro-Convulsive Therapy
Summary

• To refer patients who also require immediate hospitalization, call Dr. Stephen Hall (476-7460) or Maria Norman, ECT Coordinator (476-7848).
• To refer patients who would like an initial outpatient consultation, call Descartes Li (476-7448) or Stephen Hall.

Electro-Convulsive Therapy
Informational Resources


Websites about Electroconvulsive Therapy:
http://www.psycom.net/depression.central.ect.html
http://www.depression.com/electroconvulsive_therapy.html
http://www.psych.org/research/apr/training_fund/clin_res/index.cfm

Electro-Convulsive Therapy
Questions and Feedback