



Electroconvulsive therapy in the elderly

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Electroconvulsive therapy (ECT) has a special role to play in the treatment of various conditions in the elderly population. It is used commonly in the treatment of late life depression and other psychiatric conditions in elderly patients [1,2] who as a group constitute a particularly high proportion of the patients receiving ECT. Treating depression in elderly patients is challenging on all levels. ECT is a reasonable choice, particularly for the elderly patient who is medically compromised and is either not tolerating or not responding to medications [1,3,4]. As per the recommendations of the APA ECT Task Force, ECT may be used with elderly patients regardless of age. The efficacy of ECT does not diminish with advancing age and may be enhanced [3]. All somatic treatments, including ECT, are associated with increased risk in elderly patients, particularly those with concurrent physical illness. Clinical experience, however, suggests that ECT may have a lower risk for complications than some forms of pharmacotherapy among elderly patients. Doses of anticholinergic, anesthetic, and relaxant agents may need to be modified based on the physiologic changes associated with aging. ECT stimulus intensity should be selected with an awareness that seizure threshold generally increases with age. Decisions about ECT technique should be guided by the possibility that ECT-induced cognitive dysfunction may be greater in elderly patients, particularly in those with pre-existing cognitive or neurologic impairment.

Mechanism of action

Intensive research has been performed relative to mechanism of action of ECT. Its exact mechanism of action is not clear, however. Its efficacy in a wide range of psychiatric illnesses indirectly suggests a multi-modal action on brain cells. Obtaining adequate EEG seizure duration during ECT procedures is mandatory

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for its therapeutic effects. The phenomenon of increased seizure threshold during the course of ECT suggests its anticonvulsant property is by way of the GABAergic pathway, which may suppress kindling in limbic centers [5].

Animal models and studies in humans have demonstrated ECT-induced alterations at neurotransmitter and neuroreceptor level. Downregulation and desensitization of β -noradrenergic receptors is a likely hypothesis underlying the mode of action of ECT. It decreases serotonin turnover and acetylcholine levels in the brain and cerebrospinal fluid (CSF) and also may result in reduction in dopamine levels [6,7].

Indications

Indications for ECT are given in Table 1.

Major depression

ECT is an efficacious treatment for unipolar and bipolar depressive episodes [8–11]. O'Connor et al [51] studied the influence of age on the response of major depression to electroconvulsive therapy as part of a multisite longitudinal study comparing continuation ECT versus continuation pharmacotherapy. O'Connor et al determined the response of 253 patients with major depression to acute phase, bilateral ECT using the 24-item Hamilton Depression Rating Scale. Remission rates for three age groups, ≥ 65 years, 46–64 years, and ≤ 45 years, were 90%, 89.8%, and 70%, respectively. Age, as a continuous variable, thus positively influenced response to treatment. Also, bilateral, dose-titrated ECT was a highly effective acute treatment for major depression, and older age conferred a greater likelihood of achieving remission.

Table 1
Indications for electroconvulsive therapy

Principal diagnostic indications
Major depression
Unipolar and bipolar depressive episodes
Mania
Bipolar disorder, mania, and bipolar disorder, mixed
Schizophrenia
Schizophreniform disorder
Schizoaffective disorder
Patients with nonspecific psychotic symptoms
Other diagnostic indications
Mental disorders caused by medical conditions
Severe secondary affective and psychotic conditions displaying symptoms similar to those of primary psychiatric diagnosis, including catatonic states
Deliria of various etiologies, including toxic and metabolic
Medical disorders
Parkinson disease (including those with the “on–off” phenomenon)
Intractable seizure disorder

There are few data addressing the outcome of ECT for people older than 75 years of age. In a prospective, multisite study, Tew et al [13] compared characteristics and treatment outcomes of adult (59 years and younger), young–old (60–74 years), and old–old (75 years and older) patients treated with ECT for major depression. Both older groups had significantly greater burdens from physical illness and global cognitive impairment at baseline than the adult subjects. Both older groups had shorter index depressive episodes and were less likely to have had adequate responses to adequate medication trials before ECT. The older groups had higher seizure thresholds, but the three groups received similar courses of treatment. The adult patients showed a significantly lower rate of ECT response (54%) than the young–old patients (73%), whereas the old–old patients had an intermediate rate of response (67%). Despite a higher level of physical illness and cognitive impairment, even the oldest patients with severe major depression tolerated ECT in a manner similar to that of younger patients and demonstrated a similar or better acute response.

Mania

ECT is an efficacious treatment for mania, including bipolar disorder, mania, and bipolar disorder, mixed [11,12,14–16]. Not many data are available about the use of electroconvulsive therapy in geriatric bipolar patients, however.

Schizophrenia

ECT is an efficacious treatment for psychotic exacerbations in patients with schizophrenia in situations such as when psychotic symptoms in the present episode have an abrupt or recent onset, when schizophrenia is of the catatonic type, or when there is a history of a favorable response to ECT [11,15,17].

ECT is an efficacious treatment for related psychotic disorders, notably schizophreniform disorder and schizoaffective disorder and also may be useful in patients with nonspecific psychotic symptoms [11,18,19].

Kramer [20] studied the use of ECT in five female patients with chronic schizophrenia and schizoaffective disorder. Patients were 58–74 years old. Four patients were considered treatment-resistant to medication. One patient objected to any use of medication and opted for ECT when she became psychotic. Four patients received concurrent antipsychotic medication during and after the course of ECT. Three patients followed the acute course of ECT with a course of maintenance ECT. All five patients experienced improvement in their psychosis.

Other diagnostic indications

For other diagnoses, the efficacy data for ECT are only suggestive, or only a partial consensus exists in the field supporting its use. In such cases, ECT should be recommended only after standard treatment alternatives have been considered as a primary intervention. The presence of such disorders, however, should not

deter the use of ECT for treatment of patients who also have a concurrent major diagnostic indication.

Mental disorders caused by medical conditions

ECT may be effective in the management of severe secondary affective and psychotic conditions displaying symptoms similar to those of primary psychiatric diagnosis, including catatonic states, and some evidence exists that it may be effective in treating deliria of various etiologies, including toxic and metabolic [11,17,19,21].

Medical disorders

The neurobiologic effects of ECT may be of benefit in a small number of medical disorders. Such conditions include Parkinson disease (including those with the “on–off” phenomenon) [11,22–24] and intractable seizure disorder [11,25].

Contraindications

There are no absolute medical contraindications to ECT. In situations in which ECT is associated with an increased likelihood of serious morbidity and mortality, the decision to administer ECT should be based on the premise that the patient’s psychiatric condition is grave and that ECT is the safest treatment available. Careful medical evaluation of risk factors should be performed before ECT, with specific attention to modifications in patient management or ECT technique that may diminish the level of risk. As discussed later, patients with raised intracranial pressure (ICP) historically have been considered to be at high risk during ECT; however, more recently the APA task force on ECT concluded that such patients pose a risk, but there was no absolute contradiction to ECT.

Pre-ECT evaluation

A careful general medical history and physical examination should be performed, focusing particularly on neurologic (eg, fundi examination for papilledema), cardiovascular, and pulmonary systems, together with an assessment of oral/dental issues to define risk factors.

An anesthetic evaluation addressing the anesthetic risk and advising of the need for modification in ongoing medications or anesthetic technique should be performed also.

Risk factors

Space-occupying lesions (SOL) and brain tumors

Patients with SOL of the brain with increased ICP historically have been considered to be at high risk during ECT mainly because of the exacerbation of ICP with ECT and a risk for herniation. More recently, however, the APA task

force on ECT concluded that such patients pose a risk, but there was no absolute contradiction to ECT [11,26]. Several case reports also have noted safe and successful ECT in the presence of intracranial tumors, particularly meningiomas [27]. Recently there was a report of successful ECT administered to a patient with depression who had a brain tumor and increased ICP [4].

Cerebrovascular disease

In antidepressant-resistant patients with poststroke depression, ECT is effective, but there is no generally accepted recommendation as to how long to wait after a stroke before administering ECT [28]. It is recommended that caution be used, treatment carefully monitored, and ECT administered in the acute post-stroke period only in settings in which adequate medical, neurologic, and radiologic consultations are available [29]. Patients being considered for ECT who have intracranial vascular masses (IVM) such as brain aneurysms are at risk. A recent review of the literature and case reports outlines eight cases of ECT performed in patients with IVM, none of whom had adverse outcomes. Also, patients with vascular depression may be at increased risk for confusion or transient cognitive worsening post-ECT.

Cardiovascular disease

Recent myocardial infarction (MI) is a risk for reinfarction during ECT [30]. Although not studied objectively, it is suggested that after MI, a 3-month interval be allowed to lapse before undergoing ECT. Other significant cardiovascular risk factors that must be assessed include uncompensated congestive heart failure, severe valvular disease, unstable angina, uncontrolled hypertension, fragile vascular aneurysms, and clinically significant cardiac arrhythmia [11].

Diabetes mellitus

Patients with unstable or insulin-dependent diabetes mellitus (IDDM) should be considered for medical consultation before ECT to help ensure appropriate adjustments in diabetic management, particularly with respect to the period of pre-ECT fasting. Diabetic conditions should be stabilized as much as possible before treatment [11].

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Seizure disorders

Patients with epilepsy may be at slightly increased risk for prolonged or spontaneous seizures during ECT. Anticonvulsant medications also may compli-

cate ECT. The indications for anticonvulsant treatment thus should be confirmed and dosages of all medications that elevate seizure threshold should be kept as low as clinically feasible during ECT [31].

Hyperthyroidism

Clinically significant hyperthyroidism substantially increases the risk for thyroid storm at the time of ECT. Treatment of hyperthyroid states therefore should be optimized with the assistance of specialty consultation, and β -blocking agents should be used at the time of ECT unless otherwise contraindicated [32].

Electrolyte disturbances

Hypokalemia may be associated with prolonged paralysis and apnea after ECT, and patients with hyperkalemia are at increased risk for cardiotoxic effects because of the transient increase in serum potassium with succinylcholine. Also, hyponatremia can lead to spontaneous seizures. Clinically significant hypokalemia, hyperkalemia, and hyponatremia therefore should be corrected before ECT if possible.

Medication adjustments

Theophylline

Even with blood levels in the therapeutic range for asthma control, theophylline has been linked to status epilepticus during ECT. Theophylline thus should be discontinued whenever possible or its dosage should be kept as low as possible [33].

Benzodiazepines

Substantial evidence has shown that benzodiazepines increase seizure threshold and reduce seizure duration in a dose-dependent fashion. Also, because they have independent amnestic effects there is concern especially in elderly patients that negative synergism with ECT may accentuate cognitive side effects. If clinically feasible, efforts should be made to lower the dose or discontinue benzodiazepines before an ECT course. If a benzodiazepine is used during ECT, it should have a short half life and be withheld at least 8 hours before an ECT treatment [34].

Anticonvulsant medications

These medications increase seizure threshold and interfere with seizure expression. When anticonvulsant medications are prescribed for a psychiatric indication it is advisable to taper and discontinue them as rapidly as possible before an index ECT course. For patients getting anticonvulsant medications for

treatment of a seizure disorder, however, the morning dose is usually withheld before ECT [35].

Lithium

Patients receiving lithium during ECT may be at higher risk for delirium or prolonged seizures. Lithium should be discontinued or its levels should be kept in the low therapeutic range based on risk/benefit analysis of potential toxicity versus the risk for affective relapse.

Diuretics

Diuretics may increase the likelihood of incontinence or very rarely bladder rupture and may be withheld until after the treatment [36].

Hypoglycemic agents

Hypoglycemic medications including insulin generally are withheld until after the treatment. Some practitioners, however, advocate splitting the morning dose of long-acting insulin and administering half of it before ECT and half after the treatment when indicated.

L-dopa/carbidopa

These agents usually are held for 24 hours secondary to increased risk for post-ECT delirium.

Technique

Electrode placement

Electrode placement can be unilateral or bilateral. With standard bilateral (bifrontotemporal) ECT, electrodes should be placed on both sides of the head, with the midpoint of each electrode approximately 1 inch above the midpoint of a line extending from the tragus of the ear to the external canthus of the eye. To minimize verbal memory impairment, virtually all unilateral ECT is administered over the right cerebral hemisphere. The preferred configuration involves one electrode in the standard frontotemporal position used with bilateral ECT, with the midpoint of the second electrode 1 inch lateral to the vertex of the scalp (d'Elia placement).

Bilateral ECT produces more short- and long-term adverse cognitive effects than right unilateral ECT. In cognitive side effects, the advantage of right unilateral compared with bilateral ECT presumably is maintained across psychiatric diagnoses. In elderly patients to minimize cognitive effects one thus might prefer to start with first unilateral nondominant hemisphere ECT. Switching to bilateral ECT is indicated in patients who fail to respond to unilateral.

Premedications

Premedication with an anticholinergic agent before anesthetic induction reduces the risk for vagally-mediated bradyarrhythmias or asystole and helps dry up secretions. Traditionally, anticholinergic agents have been administered either intravenously, 2–3 minutes before anesthesia, or intramuscularly, 20–30 minutes before anesthesia. Agents used are atropine, 0.4–0.8 mg intravenously (or 0.30–0.6 mg intramuscularly) or glycopyrrolate, 0.2–0.4 mg intravenously or intramuscularly. Glycopyrrolate is preferable because it is less likely to cross the blood–brain barrier and contribute to delirium.

Choice of anesthetic agents

The anesthetic agent of choice for ECT in elderly adults is methohexital. It has an established safety record, is effective, and has a low cost. Typically it is given in doses of 0.5–1 mg/kg body weight. Alternative agents are etomidate, ketamine, propofol, and thiopental. Across their respective dosing ranges, seizure duration is longer with etomidate than methohexital or propofol. Etomidate may be considered particularly for patients with congestive heart failure and related conditions because it is less likely to result in hypotensive effects compared with alternatives. Ketamine usually is reserved for instances in which adequate seizure elicitation cannot be accomplished with maximal device settings [37,38].

Muscle relaxants

Succinylcholine is the neuromuscular blockade agent used most frequently in ECT. After the anesthetic induction is completed, a lower extremity is cuffed off with a blood pressure cuff before the administration of succinylcholine to be able to visually monitor seizure activity. One should observe the patients for fasciculations. Complete paralysis can be determined by testing for absence of a patellar deep tendon reflex.

Cardiovascular agents

In older adults, β -adrenergic receptor antagonists like esmolol and labetalol frequently are used to minimize changes in heart rate or blood pressure. When Castelli et al [39] compared esmolol and labetalol with placebo in patients at elevated cardiac risk, these drugs successfully reduced ECT-induced hemodynamic elevations.

Caffeine

In the context of missed or abortive seizures, some clinicians have used caffeine sodium benzoate (500–2000 mg intravenously, equivalent to 250–1000 mg of pure caffeine) to produce or lengthen generalized seizures. This preparation is

administered a few minutes before anesthetic induction [40]. Also, a study of elderly patients found that caffeine-augmented ECT is safe and effective in increasing seizure duration in elderly patients. More research needs to be done to determine optimal dosing and tolerability, however [41].

Adverse effects

Adverse effects of ECT are generally preventable and manageable. Adverse effects of ECT are given in Table 2.

Cardiovascular complications

Cardiac complications with ECT include arrhythmias, T wave and ST segment changes, ischemic events, atrial arrhythmias, and sinus bradycardia. The initial bradycardia and also the postictal bradycardia can be diminished by pretreatment with anticholinergic agents like atropine and glycopyrrolate. In most cases ECT-induced ECG changes are time limited and do not require specific interventions. The hemodynamic changes can be dampened by judicious use of β -adrenergic receptor antagonists like esmolol and labetalol [39] at the time of treatment and by premeditation with short-acting calcium channel blockers such as nifedipine. Post-ECT arrhythmias can be treated with lidocaine, and atropine can be used to treat bradyarrhythmias.

Prolonged seizures

Patients infrequently may experience prolonged seizures and status epilepticus. These are more likely in patients receiving medications or having medical conditions that lower seizure threshold or interfere with seizure termination. This generally is treated with further administration of the same barbiturate anesthetic used during ECT or benzodiazepines, such as diazepam or lorazepam that can be given intravenously.

Table 2
Adverse effects of electroconvulsive therapy

Cardiovascular complications
Prolonged seizures
Prolonged apnea
Cognitive side effects
Headache, muscle soreness, and nausea
Treatment-emergent mania
Postictal delirium

Prolonged apnea

Prolonged postictal apnea is a rare event that occurs primarily in patients who have slow metabolism of succinylcholine. Maintaining adequate oxygenation is performed in these instances, which usually resolve spontaneously within 30–60 minutes. At subsequent treatments, a very low dose of succinylcholine may be used or a nondepolarizing muscle relaxant such as atracurium may be substituted.

Cognitive side effects

Cognitive impairments like memory loss and decreased orientation, attention, calculation, and recall can occur. Cognitive adverse effects frequently are related to the form of ECT administration. Potential treatment modifications include changing from bilateral to right unilateral electrode placement, decreasing the intensity of electrical stimulation, increasing the time interval between treatments, and altering the dosage of medications [42].

Headache, muscle soreness, and nausea

Headache is a common side effect of ECT and is observed in as many as 45% of patients during and shortly after the postictal recovery period [43]. In most patients, post-ECT headache is mild, although a sizable minority report severe pain associated with nausea and vomiting. Treatment of post-ECT headache is symptomatic. Drugs like aspirin, acetaminophen, and NSAIDs are useful and effective.

Treatment-emergent mania

A small minority of patients with depression or those with mixed affective states switch into hypomania or mania during the ECT course. Although this reaction is rare, patients with bipolar disorder may be the most likely to exhibit it [44,45].

Postictal delirium

At one or more treatments a minority of patients may develop postictal delirium or excitement characterized by motor agitation, disorientation, and poor response to commands [46]. Depending on its severity it can be managed supportively or pharmacologically. Increased instances occur in patients with pre-existing cognitive impairment and in patients with vascular depression. If supportive intervention is used, the patient should be reassured continuously and gently restrained to protect against physical injury and intravenous line loss. Pharmacologic management typically involves intravenous administration of the agent used to produce anesthesia or a benzodiazepine sedative/hypnotic agent (eg, diazepam or midazolam). These agents should be administered after return of spontaneous respiration.

Frequency of treatments

Usually two or three treatments per week are administered on nonconsecutive days. Most facilities in the United States presently use three treatments per week. Multiple monitored ECT (MMECT) is a form of treatment in which more than one adequate seizure is produced in the same treatment session under continuous anesthesia. Proponents of this technique suggest that a smaller number of treatment sessions, and therefore a shorter time interval, are required to produce the same quality of remission as with conventional ECT. Critics of the method contend that MMECT is associated with a higher risk for neurologic and cardiovascular morbidity and adverse cognitive effects.

Number of treatments

The total number of ECT treatments administered should be a function of the patient's response and the severity of adverse effects. Response should be determined by changes in the target symptoms with assessment between each ECT treatment. For those patients who achieve clinical remission, the treatment course should end as soon as maximal improvement is reached. Also, termination should be considered in patients who have shown substantial but incomplete clinical improvement yet remain unchanged after two additional treatment sessions. Repeated courses of ECT are sometimes necessary because of relapse or recurrence of the psychiatric condition. There is no evidence that repeated courses of ECT lead to permanent structural brain damage or that a limit on the maximum lifetime number of treatments with ECT is appropriate.

Continuation ECT

Continuation ECT may be given on an outpatient or inpatient basis. High relapse rates even in patients complying with psychotropic continuation drug therapy regimens have led some practitioners to recommend continuation ECT for select individuals. Continuation of ECT is indicated if the patient has a history of illness that has been responsive to ECT, and one of the following has occurred: (1) pharmacotherapy alone has not been effective in treating index episodes or in preventing relapse or recurrence, (2) pharmacotherapy cannot be administered safely, and (3) the patient prefers treatment with ECT, and the patient or surrogate consentor agrees to the continuation of ECT. The patient must be capable, with the assistance of others, of complying with the treatment plan.

Maintenance ECT

Maintenance ECT is defined as the prophylactic use of ECT longer than 6 months past the end of an index episode, usually of major depression. The

specific criteria for it are the same as those described for continuation ECT. Maintenance ECT treatments should be administered at the minimum frequency compatible with sustained remission and continued need for it should be reassessed at least every 6 months.

Future directions

Repetitive transcranial magnetic stimulation (rTMS)

Repetitive transcranial magnetic stimulation [47] is a noninvasive technique to induce electric currents in the brain. In particular, rTMS evokes strong neural responses in the paraventricular nucleus of the thalamus (PVT) and in other regions involved in the regulation of circadian rhythms. rTMS uses a magnet to allow focused electrical stimulation across the scalp and cranium. ECT treatments and rTMS clearly have different mechanisms of action and may have different clinical usefulness. Although the effectiveness of ECT is extremely well established, rTMS is at best still being developed, but holds great promise for having significantly fewer side effects.

Parkinson disease

Patients with treatment refractory Parkinson disease may respond to ECT. This is particularly effective when there is a marked “on–off” phenomenon that often occurs with medication management in late-stage Parkinson disease [22–24].

Epilepsy

Because of its anticonvulsant properties, ECT is a useful adjunctive therapy for some cases of intractable medication-resistant epilepsy or status epilepticus [25].

Pain

ECT may be useful also in chronic pain. Bloomstein et al [48] studied 21 patients who were considered to have chronic pain syndromes, and 20 of these patients improved after ECT treatment. Mandel [49] studied patients with pain and depression who had failed tricyclic antidepressant therapy, and ECT improved pain syndromes in this group also. Phantom limb patients who are refractory to multiple therapies also may respond to ECT [50].

Summary

ECT is a safe, useful, and effective treatment for a variety of disorders and can be administered safely in elderly patients. Efforts need to be undertaken to increase the awareness and acceptability of ECT treatments.

As Carl Salzman says in the January 1998 issue of the American Journal of Psychiatry, “Let us not perpetuate outmoded, nonscientific and incorrect attitudes toward ECT in our younger colleagues. Rather, let us stimulate scientific curiosity and research into this cost-effective and safe psychiatric treatment.”

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