Electroconvulsive Therapy and Medical Illness

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Physicians who use electroconvulsive therapy (ECT) need to be vigilant for unstable medical conditions before and during the course of treatment. This brief review is intended to highlight some basic principles and specific concerns that may be encountered in the use of ECT in patients who have comorbid medical illness.

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Physicians who use electroconvulsive therapy (ECT) need to be vigilant for unstable medical conditions before and during the course of treatment. This brief review is intended to highlight some basic principles and specific concerns that may be encountered in the use of ECT in patients who have comorbid medical illness. For more extensive discussions, I refer the reader to recent reviews of ECT in the medically ill by Abrams1 and Rasmussen and colleagues,2 as well as the recommendations of the American Psychiatric Association Committee on ECT.3

General principles of care

Safe use of ECT in the medically ill patient begins with a careful pretreatment evaluation. The cornerstones of this are the medical history, review of systems, and physical examination, which together are far more important than blood tests or other diagnostic studies. Any significant abnormalities that emerge, especially those relevant to the cardiac, respiratory, or neurologic systems, can be investigated with a rational choice of diagnostic tests and medical consultations. For example, in patients with unstable heart disease, an echocardiogram may be helpful in assessing how the heart will react to the stress of an ECT treatment and may indicate the need for pretreatment modification of the patient's medication regimen.

Routine pre-ECT tests should include serum electrolyte levels and an ECG. A chest x-ray study should be considered in elderly patients and in those with pulmonary disorders. Brain imaging studies, such as CT or MRI, are not routinely needed but should be considered for those in whom the history or physical examination suggests structural CNS pathology.

The second principle is careful monitoring of the patient during each treatment. If cardiac medications, glaucoma eyedrops, or inhalers are prescribed, these should be administered before each treatment.2,3 For patients with severe cardiac disease, tight control of blood pressure may be advisable; accordingly, antihypertensive medications can be used in the treatment suite.

The third basic principle for the medically ill patient receiving ECT is (CHF) who was well compensated cardiologically before the first treatment may be having some pulmonary congestion after several treatments. Only ongoing evaluation of the medical status throughout treatment to monitor for destabilization of existing conditions or emergence of new ones. For example, a patient with congestive heart failure through daily history taking and physical examination can the physician detect such subtle changes.

Medical physiology of ECT

Abrams1 and Rasmussen and colleagues2 provide detailed discussions about the medical physiology of ECT seizures, an understanding of which helps inform management before and during ECT in patients with medical conditions. I will review this topic only briefly here. The main organ systems affected during seizures are the brain, of course, and the heart. Over the decades, there has been a plethora of research on neurometabolic effects of electrically induced seizures in humans and animals, none of which specifically has implications at present for ECT in medically ill patients. From a neurovascular standpoint, a rapid increase in cerebral perfusion occurs, resulting in increased permeability of the blood-brain barrier as well as a temporary rise in intracranial pressure. Such changes would be expected to have implications for patients with space-occupying lesions and increased intracranial pressure (eg, brain tumors). Another robust neurophysiologic change in ECT is
a rise in the electrically induced seizure threshold (thus, an anticonvulsant effect), an interesting phenomenon that has formed the basis for the occasional use of ECT to reduce spontaneous seizure frequency in patients with epilepsy.4

The cardiac physiologic effects of ECT have been well characterized. Barbiturate anesthetics have a slight depressing effect on blood pressure. Immediately after the presentation of the electrical stimulus, there is a sometimes profound parasympathetic stimulation that leads to a few seconds of asystole.5 This is rapidly replaced by a sympathetic predominance (assuming that the electrical stimulus was of sufficient intensity to produce a seizure) that leads to a sharp rise in heart rate and blood pressure, effects that abate shortly after the end of the seizure. In addition, various arrhythmias, such as premature ventricular contractions, premature atrial contractions, and even very brief runs of ventricular tachycardia without blood pressure compromise, are quite common. These various physiologic changes would clearly have implications for patients with cardiac conditions such as congestive heart failure, coronary artery disease, cardiomyopathies, and arrhythmias.

Given the physiologic changes associated with ECT, it bears repeating that a thorough pre-ECT evaluation, careful management during treatments, and vigilant intertreatment monitoring form the bulwark of care for patients with any medical illness who undergo ECT.

Cardiovascular illnesses

The most common cardiac conditions encountered in ECT practice are coronary artery disease, CHF, and arrhythmias. For the patient with coronary artery disease, the internist or cardiologist will want to ask detailed questions about exercise tolerance, angina pectoris, and shortness of breath. Cardiac auscultation will also provide information about the stability of myocardial function. Consultation with a cardiologist or with an internist familiar with ECT is suggested for such patients. Pretreatment diagnostic tests, such as echocardiography or nuclear medicine scanning, may assess how the patient's heart responds to the increased myocardial workload that occurs during seizures. If evidence of ventricular wall motion abnormalities or ischemic changes is present, then cardiac medication changes or even revascularization procedures should be considered before ECT. If the cardiologist does not recommend such a course of action, then consideration may be given to use of β-blockers during the ECT treatments to lessen the increase in myocardial workload. Communication between the attending cardiologist and anesthesiologist is crucial to settle on a rational management plan.

CHF presents a special challenge in ECT, because patients with CHF are often exquisitely sensitive to increases in myocardial oxygen demand.2 Again, cardiologic consultation is recommended for such patients to optimize their medication regimen before ECT is begun; a marginally compensated patient may easily proceed to frank decompensation after a few treatments.6 It is important to administer the patient's prescribed cardiac medication regimen, including diuretics, on the morning of each ECT treatment.

The most common arrhythmia in patients receiving ECT is atrial fibrillation. There are numerous reports of safe use of ECT in patients with atrial fibrillation, but conversion to normal sinus rhythm has been described and the risk of thrombus/embolus formation is also present.7 Thus, maintaining anticoagulation with warfarin or heparin during ECT is usually recommended in such patients. If the heart rate is not controlled at baseline, the cardiologist will probably recommend treatment to control it before proceeding with ECT. Patients with pacemakers or implantable cardioverter-defibrillators (ICDs) can be treated safely with ECT; recommended management includes pretreatment device interrogation to ensure proper function and turning off of ICDs (after continuous ECG monitoring has been started) under the guidance of competent personnel.8

The most common neurologic illness in patients receiving ECT is dementia, usually of the Alzheimer or Lewy body type. Numerous case series have documented that demented patients can attain significant benefit in mood and disruptive behaviors with ECT without apparent long-term worsening of the dementing process.9 I recommend that demented patients be treated with unilateral or bifrontal electrode placement to lessen cognitive effects. Patients who have Parkinson disease (PD) often experience motoric improvement with ECT, possibly as a result of enhanced dopaminergic function.10

On the other hand, some evidence suggests that in patients with basal ganglia dysfunction, such as those with PD, ECT may have excessive cognitive effects, so either unilateral or bifrontal electrode placement is recommended in these patients. There may also be dyskinesias during ECT in patients with PD who are taking levodopa, so the dosage of that drug may need to be reduced temporarily.
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during the course of treatments.\textsuperscript{10}

Because of the increase in intracranial pressure during seizures, brain tumors or other intracranial masses-- especially those associated with increased intracranial pressure--may pose a substantial risk of neurologic deterioration during ECT.\textsuperscript{11} Several case reports do seem to indicate that meningiomas not associated with edema or mass effect may pose no increased risk during ECT.\textsuperscript{12}

There is no evidence that ECT worsens the course of epilepsy; in fact, it may reduce the frequency of spontaneous seizures in patients with epilepsy.\textsuperscript{4} However, seizure induction may be difficult if the patient is taking anticonvulsant medication. Cautious dose reduction of such medications, if deemed safe by the patient's neurologist, may result in enhanced seizure expression during ECT. Patients with neuroleptic malignant syndrome (or other forms of malignant catatonia) may experience dramatic improvement with ECT.\textsuperscript{3} Patients with a wide variety of other neurologic conditions, as documented in an extensive case report literature, can be treated safely with ECT.\textsuperscript{2} A possible exception is multiple sclerosis, especially with gadolinium-enhancing lesions on MRI; there is one report of neurologic worsening with ECT in a patient with such lesions.\textsuperscript{13}

\textbf{Other medical conditions}

If inhalers have been prescribed for a patient with chronic obstructive pulmonary disease or asthma, these should be administered before each treatment. Theophylline in patients receiving ECT has been associated with status epilepticus, and if the patient is taking this medication, blood levels should be checked regularly.\textsuperscript{14}

Patients with diabetes who are taking insulin can be given half their usual morning dose and treated promptly with ECT, then given the remaining half and fed breakfast. Non-insulin-dependent persons should not be given their morning oral hypoglycemic agent until after the treatment, when they can eat a meal. Blood sugar should be checked before each treatment by fingerstick.

In the third trimester of pregnancy, the sympathetic stimulation associated with the seizure may be associated with abruptio placentae or premature labor. In such cases, noninvasive fetal monitoring is recommended; ECT should only be conducted if obstetric services are readily available.\textsuperscript{3}

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\textbf{References}


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