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Electroconvulsive Therapy for Treatment of Major Depression in a 100-Year-Old Patient with Severe Aortic Stenosis: A 5-year follow up report

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Abstract

Although there is no specific age cut-off for ECT and no absolute contraindication to its use, very old age as well as the presence of cardiac conditions such as aortic stenosis are factors that may negatively impact the clinician's decision to administer ECT in the individual case.

We report our follow-up of a 100 year old female with severe aortic stenosis who has now received ECT safely for a period of 5 years. No cardiac complications have emerged during this period. Her prior unipolar depressive episode with catatonic features remains in remission with a single prophylactic ECT session every 3 months.

We have observed from our experience with this unique case that periodic multidisciplinary re-evaluation of the evolving risk-benefit profile of ECT is essential along with the inclusion of family members in this dialogue. Our patient course illustrates that neither advanced age nor severe aortic stenosis are absolute contraindications to ECT even over an extended period of time. Each case needs to be evaluated on its merits.

To our knowledge, this case represents the oldest patient in the literature where ECT has been administered safely for such an extended period in the setting of severe aortic stenosis.

Keywords

Major depression; severe aortic stenosis; elderly; electroconvulsive therapy; risk

Introduction

Since its introduction in 1938¹, electroconvulsive therapy (ECT) remains the most effective intervention for severe depression.² ECT is indicated in cases of major depression when adequate antidepressant treatment proves to be ineffective or intolerable or when the severity of symptoms warrants a rapid response (i.e., suicidality or inanition).^{3,4} It is recognized as a highly effective and safe treatment in psychiatry.⁵

The efficacy and safety of ECT in geriatric patients has been demonstrated in a number of studies and reports. Response rates in older depressed patients range from 63% to 98% with a relatively benign adverse event profile that is similar to that of younger patients.⁶⁻¹⁴ In fact, although controversial, evidence suggests that age is a positive predictor of response to ECT.^{6,7,13-16}

The rate of ECT associated cardiovascular complications is estimated to be 7.5% in healthy patients and 55% in patients with preexisting cardiovascular conditions.¹⁷ Fortunately, most of these complications are transitory arrhythmias that are either self-correcting or effectively controlled with prompt use of medications such as beta blockers.¹⁷⁻¹⁹

Although there is no age limit for ECT and no absolute contraindication to its use, very old age, as well as the presence of certain cardiac conditions such as severe aortic valve stenosis, are factors which may negatively influence the clinician's decision to administer ECT.

We present here our 5-year follow-up of maintenance ECT in a case of severe aortic stenosis in an elderly female. Our initial report described a safe course of acute ECT when this patient was 96 years old.¹⁸ Now with our patient at the age of 100, we report the 5 year outcome of ECT treatment in this case.

Case Description

This widowed woman was initially brought by her daughter to our institution at the age of 96 with a recurrence of severe unipolar depression. This episode was characterized by anhedonia with catatonic features including decreased oral intake, motor inactivity, and severely diminished verbal output over a period of one month. Symptoms had re-emerged after the cessation of maintenance ECT which was on the grounds of her advanced age in the presence of severe aortic stenosis (aortic valve area = 0.5 cm²). Her major depressive disorder (MDD) had commenced in her 70s and after unsuccessful trials with nortriptyline and citalopram had responded to an acute ECT course followed by maintenance ECT over several years. The recent precipitous decline following discontinuation of maintenance ECT (last session 6 weeks prior to presentation) warranted reinstitution of ECT with achievement of remission after an index course of 9 sessions of bilateral-bifrontal stimulation, as previously reported¹⁸.

5 year ECT Treatment Course

An episode of syncope occurred after the completion of an initial 6 months of continuation ECT (1 per month session frequency). For this reason ECT was withheld, resulting in a relapse of the patient's depression. A medical workup of syncope performed by her primary care physician concluded that the syncope was due to transient dehydration and not worsening of her aortic stenosis. ECT was thus safely resumed at the same parameters, in light of the clinical confirmation that ECT maintenance was still needed to prevent depressive relapse.

To date, this patient has safely tolerated a total of 41 sessions of which 27 were conducted during the maintenance treatment phase (the remaining 14 representing 9 acute sessions plus 5 continuation sessions over the initial 6 months). The frequency of the maintenance sessions have been gradually spaced out from once a month initially to her current schedule of one session every 3 months with a goal of minimizing the frequency of exposure to general anesthesia and hyperdynamic effects of ECT while, at the same time retaining prophylactic benefit against recurrence of depression.

Stimulation has been delivered with the same device throughout [i.e., MECTA Spectrum 5000Q device (MECTA, Tualatin, OR)] but with modifications to the stimulation technique. To minimize risks of cognitive side effects, given some baseline mild reduction in cognitive functioning, electrode placement was changed from bifrontal to right unilateral and the pulse width duration was decreased from 1 millisecond to 0.3-0.37 milliseconds duration (i.e. ultra brief pulse width duration). Sessions have been uneventful except for the expected transient elevations in blood pressure that were managed successfully with esmolol and labetalol before or after stimulation. Remifentanyl was occasionally used in combination with methohexital during anesthetic induction to minimize changes in blood pressure and heart rate and to improve seizure duration and quality. This specific combination reflected individual anesthesiologist medication preference for minimizing cardiovascular risk from her severe aortic stenosis.

Re-evaluation of Safety

A recent multidisciplinary review involving cardiology, anesthesiology and psychiatry was conducted to determine if the current risk-benefit profile was still favorable for continuation of ECT as our patient approached 100 years old. The baseline echocardiogram 5 years previously had shown severe stenosis with a valve area of 0.5 cm², a peak pressure gradient across the valve of 110 mm Hg, a mean pressure gradient of 69 mm Hg and a normal ventricular ejection fraction (70%). Her most recent echocardiogram showed an aortic valve area of 0.72 cm², a peak pressure gradient of 117 mm Hg, a mean gradient of 67.0 mm Hg and again a normal ejection fraction (>70%).

Although at first glance, it would appear that the aortic valve area might have increased over the past five years, this is not likely to be the case. The difference in computed aortic valve area between the two studies is better explained by variation in the measurement of the parameters used by the continuity equation (such as left ventricular outflow tract diameter) in the calculation of the aortic valve area. It should be clear that the degree of aortic stenosis has remained stable within the severe range (i.e. less than 0.7 cm²) over the past five years. It is also important to note that despite the severity of aortic stenosis, left ventricular systolic function has remained intact.

Her psychiatric course has been uneventful apart from a brief period of relapse when ECT was withheld pending the results of her work up for a fall. In summary therefore, this episode of severe depression has been in sustained remission for several years and there is no evidence to suggest any cardiovascular complications secondary to ECT itself.

Evaluation of Options for Treatment of Aortic Stenosis in this Case

The therapeutic options for treatment of critical aortic stenosis need to be weighed in terms of the risk-benefit ratio to the patient. An important clinical consideration for treatment, in general, is the presence or absence of any of the triad of classic symptoms of aortic stenosis; angina, heart failure, or syncope. In the absence of any of these symptoms, the presence of severe or critical aortic stenosis carries an excellent long-term prognosis.²⁰ Although our patient had a fall in the past, this was not associated with loss of consciousness and was not definitively caused by her aortic stenosis. In fact, during the periods between her ECT sessions, our patient was able to perform normal activities without significant limitation. She was able to tolerate her ECT sessions with careful consideration to the anesthetic issues outlined above.

Therapeutic considerations in this case include conservative medical management, percutaneous aortic valve procedures, or conventional aortic valve replacement. Percutaneous transluminal balloon valvuloplasty (PTAV) is a procedure that could provide

short-term relief for severe aortic stenosis, but it is limited by the high likelihood of valvular restenosis within 1-12 months.²¹ Transcatheter aortic valve insertion (TAVI) is a percutaneous procedure in which a tissue valve mounted on a stent is inserted within the stenosed aortic valve, effectively restoring normal aortic valve function.²² This technique has been shown to be effective in prolonging survival and improving symptoms in patients with severe symptomatic aortic stenosis who were deemed too high risk for conventional aortic valve surgery.²³

Conventional aortic valve replacement has been demonstrated to improve symptoms and survival in patients with severe symptomatic aortic stenosis deemed able to undergo major cardiac surgery. Our patient, however, was asymptomatic and thus it was felt was best treated with conservative medical management. Thus, from the cardiology perspective conservative medical treatment is the preferred option in the asymptomatic patient with critical aortic stenosis. Intervening surgically only on the grounds of the patient needing ECT and in the absence of symptoms (angina, heart failure, or syncope) that could be tied to aortic stenosis is not clinically justified.

Review of the Literature for Cardiac and Age related Issues during ECT

Hemodynamic responses to ECT include an initial period of bradycardia followed by a catecholamine surge with increases in cardiac output, blood pressure, and heart rate which ordinarily resolve over several minutes after seizure termination.⁵ Although transient, these changes are significant and require adequate management to minimize complication risks in already compromised patients.⁵ Zielinski et al.¹⁷ reported a 7.5% rate of ECT associated cardiovascular complications among patients without preexisting cardiovascular conditions. These complications were mostly benign post-stimulation transitory arrhythmias that resolved within minutes.

ECT studies have included patients in their nineties (up to 96 years old).^{14,24,25} Burke et al.²⁶ recently reported the successful and safe (except for a preventable fall likely unrelated to ECT) use of ECT in a 97 year old patient for the treatment of major depression. We previously reported the safe and effective use of ECT for the acute treatment of major depression in this same patient when she was 96-years old.¹⁸

More recently Mueller et al.²⁷ published a retrospective review of 10 patients with severe aortic stenosis (i.e., aortic valve area ≤ 1.0 cm²) who safely underwent ECT. The median age of the group was 79.5 years and oldest patient was a 93 year old female.²⁷ The sample experienced side effects that were transient in nature only and responded adequately to prompt treatment. Episodes of post stimulation hypotension (n=2) as well as episodes of tachycardia (>100 beats/min) and hypertension (>180 mm Hg) were reported. These episodes were reported in 7 out of 10 patients and required acute or/and preventive treatment with an alpha agonist (phenylephrine), IV fluids, beta blockers (esmolol, metoprolol), catecholamine blockers (labetalol) in 70 out of 144 sessions (49%).²⁷ No deaths occurred in this sample of 10 patients with a total of 144 sessions.²⁷

In addition to concerns regarding hemodynamic effects in the very elderly, ECT-related cognitive decline and confusion are frequent concerns in elderly patients.²⁸ This cognitive impairment seems to be transient in nature²⁴ and can be minimized by reducing the treatment frequency (i.e., number of sessions per week).^{14,29} The risk of falls related to ECT seems to increase with age and has been found to be associated with both the number of sessions and the presence of co-morbid Parkinson's disease.³⁰

Discussion

This case supports the view that ECT's risk-benefit profile is generally favorable even in cases of elderly patients who have significant concomitant medical disorders. Given that the prevalence of depression increases with age,³¹ effective treatments such as ECT should be considered in geriatric patients. Elderly patients are to be expected to have more comorbid medical conditions; however, the presence of these conditions, even if severe, should not be considered an absolute contraindication to ECT as a therapeutic option.

This 100 year-old patient appears to be the oldest patient in the literature with severe aortic stenosis to receive ECT on an extended maintenance basis (now over 5 years). In such cases it is even more important than usual to pursue periodic multidisciplinary evaluation to assess thoroughly the evolving risk-benefit of the intervention versus the risk-benefit of withholding ECT.

In the presence of severe aortic stenosis it is particularly important to avoid hypotension, decreases in preload, systemic vascular resistance, and contractility as well as excessive tachycardia.²⁷ This can be achieved by careful monitoring and prompt use of intravenous fluids, and adrenergic agonists (e.g. phenylephrine), and adrenergic blockers (e.g. esmolol and labetalol) as well as considering the addition of remifentanyl (e.g., in combination with methohexital) during anesthetic induction.^{28, 27, 32} Of note, our observations in this case and the ones from Mueller's case series, are limited to patients with severe aortic stenosis with relatively preserved left ventricular systolic function.

Other brain stimulation techniques such as transcranial magnetic stimulation (TMS) should also be considered in this patient population. Although overall less effective than ECT, TMS has a very benign side effect profile and avoids the cardiovascular effects of ECT.³³ It has been approved by the FDA in the US for patients with major depressive disorder whose current depressive episode has not responded to a single adequate antidepressant trial. As the risk-benefit profile of ECT in this case is evolving over time it would be worthwhile, in discussion with the patient and family members, to consider whether the same prophylactic benefit against recurrence of depression might be obtained via TMS rather than ECT. To date the literature on TMS and ECT provide no data to inform further the treatment of our patient in this regard.

Our patient's treatment course with ECT does indicate that ECT can be a safe treatment option for severe depression in the presence of asymptomatic aortic stenosis with normal left ventricular function and following careful evaluation in concert with our multidisciplinary colleagues.

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