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SHORT REPORT

Balance and gait in older electroconvulsive therapy recipients: a pilot study

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Background: Electroconvulsive therapy (ECT) is commonly used to treat depression in older adults. Despite its efficacy in this regard, an associated increase in the risk of falls in this population is a downside of treatment. ECT research has focused on the incidence of falls, but its effect on balance and gait – intrinsic factors in instability and falls – has not been studied. Our aim was to examine changes in balance and gait among older adults before and after a single ECT session and explore the effect of patient-related and treatment factors on any changes found.

Methods: Participants were 21 older adults requiring ECT for depression in public psychiatric services. Patients with clinically overt mobility problems (impairing test participation or increasing the risk of falls) were excluded. Balance and gait testing 1 hour pre-ECT and 1, 2 and 3 hours post-ECT included: (1) steady standing test; (2) perturbation of standing balance by self-initiated movements; (3) perturbation of standing balance by an external perturbation; and (4) timed up and go test.

Results: No deterioration in test performance was found, using one-way repeated measures analysis of variance.

Conclusion: Balance and gait did not deteriorate immediately after ECT. Exclusion of participants with clinically overt mobility problems and falls being better attributable to factors unrelated to balance and gait (such as post-ECT confusion) may account for our findings. This research does not repudiate the occurrence of ECT-related falls but calls into question the utility of introducing routine balance and gait assessment among older ECT recipients without pre-existing mobility problems as a means of preventing them.

Keywords: electroconvulsive therapy, depression, balance, gait, falls, aged

Introduction

Electroconvulsive therapy (ECT) is one of the most effective treatments available in general adult and old age psychiatry. It is more effective than pharmacotherapy for the treatment of major depression in particular, with several studies involving older adults reporting high response rates of 85%.[1–3] These rates are considerably higher than antidepressant response rates in late-life depression, which were reported in a recent meta-analysis to be as low as 46% in placebo-controlled trials and no more than 60% in comparator trials.[4] ECT remains the treatment of choice for patients whose physical health is significantly compromised by food and fluid refusal, profound psychomotor retardation, psychotic symptoms or suicidality. Older adults are over-represented among ECT recipients.[5,6] Reasons postulated for this finding include a higher incidence of psychomotor retardation and psychotic features among depressed older adults.[7]

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ECT involves the induction of a therapeutic seizure under general anesthesia and muscle relaxation using one of three electrode placements. While bitemporal ECT is the most effective form of treatment, it is more likely to be associated with adverse cognitive effects (that are usually temporary). Right unilateral treatment results in less cognitive impairment but is also less effective, unless administered at adequate suprathreshold doses.[8–11] Bifrontal placement (which avoids stimulation of both temporal regions) is also used in an effort to preserve the therapeutic advantage of bilateral treatment, whilst reducing the adverse cognitive effects of bitemporal ECT.[12,13] Additional aspects of the modern ECT technique that aim to achieve a favorable cognitive risk-benefit profile include the use of a brief-pulse bidirectional waveform and stimulus dosing based on seizure threshold determination.

Although ECT is effective in the older population, it is also associated with morbidity pertaining to falls and confusion.[14–17] Falls represent a major cause of morbidity in older people and are attributable to a range of host, activity and environmental factors.[18] De Carle and Kohn[19] used a logistic regression model, as part of a retrospective cohort design, to identify ECT as one of six variables associated with an increased risk of falling in a psychogeriatric unit. Draper et al[20] evaluated the predictive value of a falls screen instrument that was administered to all patients on admission to an aged care psychiatry unit. The authors did not find the instrument to be a good predictor of falls and thus recommended universal precautions for falls prevention, especially after ECT.[20] Additional studies that examined the safety of ECT in older adults, and thereby the incidence of related falls, were based on retrospective review of medical records.[1–3,14–17] Three of these studies specifically focused on older adults aged 75 years and over[2,3,17] and one study focused on adults aged 85 years and over.[16] In one study, falls were documented in 14% of the 'young-old' (65–80 years) and 36% of the 'old-old' (>80 years) in the period after treatment.[1] Another study found the incidence of falls to be 15% in patients aged ≥60 years compared to 0% in younger individuals.[15]

While research on ECT safety has focused on the incidence of falls, the effect of ECT on balance and gait has not been studied, despite balance and gait abnormalities being intrinsic factors contributing to instability and falls. It is likely that ECT impairs balance and gait in some vulnerable patients. Conversely, its antidepressant effects can lead to a rapid improvement in mood, cognition, confidence, mobility, nutrition and hydration, all of which should lead to an improvement in balance and gait over a treatment course.

Our main objective in undertaking this modest pilot study was to examine changes in balance and gait in older adults before and after a single ECT treatment. We sought to explore associations between balance and gait on the one hand, and patient-related factors and treatment parameters on the other. To the best of our knowledge, this study is the first to prospectively examine the effects of ECT on tests of balance and gait. While the falls screening instrument developed by Draper et al[20] incorporated limited testing of functional mobility, it was administered routinely to all patients on admission to a psychogeriatric unit, rather than before and after an ECT treatment session. Pilot data generated by this project were anticipated to help build a case for a larger, multicenter study and eventually assist in identifying patients at greatest risk of falling in the context of ECT.

Materials and methods

Subjects

Participants were older adults requiring acute or maintenance ECT for severe depression. Inclusion criteria were: (a) age ≥65 years; (b) informed consent to participate in the study; (c) unipolar or bipolar depression, either current episode or in remission; (d) ECT prescribed according to clinical indications and practice guidelines; (e) ambulant without aids; and (f) ability to communicate in English. Exclusion criteria were: (a) involuntary status under the Mental Health Act;[21] and (b) clinically overt mobility problems which, in the opinion of a patient's treating psychiatrist, were likely to impair test performance or increase the risk of falls during testing. (These were often due to preexisting musculoskeletal or neurological conditions.)

Setting

Participants were recruited from two public aged mental health services: Kingston Centre (MonashHealth, VIC, Australia) and Geelong Hospital (Barwon Health, VIC, Australia). At both services, ECT is administered on either an inpatient or outpatient basis by a multidisciplinary team of consultant and trainee psychiatrists and anesthetists, an ECT nurse coordinator and other nursing staff. The study protocol was approved by the Human Research Ethics Committees of MonashHealth and Barwon Health.

Electroconvulsive therapy procedures

ECT was administered using a Thymatron DGx or System IV machine (Somatics LLC, Lake Bluff, IL, USA). Benzodiazepine and anticonvulsant medications were withdrawn several days prior to ECT commencing.

Preoxygenation was used prior to anesthetic induction and propofol and suxamethonium were the preferred anesthetic agents. Psychiatrists were free to choose electrode placement (right unilateral, bitemporal or bifrontal), energy levels and treatment frequency. All psychiatrists had completed accredited ECT training and regularly administered ECT with stimulus dose titration according to statewide guidelines.[22] Information about ECT treatment parameters was collected from patients' clinical records.

Clinical assessment

All participants underwent a thorough evaluation including psychiatric and medical history, mental state and physical examination, medication review, blood testing, electrocardiography and chest X-ray. Information obtained from subjects' clinical records included demographic details; falls history; and current psychiatric and medical medications. Mini Mental State Examination (MMSE)[23] and Hamilton Depression Rating Scale (HAMD)[24] scores were routinely available. The Barthel Index,[25] a measure of physical dependence, was completed in consultation with nursing staff.

Balance and gait assessment

Four tests of balance and gait were administered for each patient, before and after a single ECT treatment, at the following time points: (a) 1 hour pre-ECT (T1); (b) 1 hour post-ECT (T2); (c) 2 hours post-ECT (T3); and (d) 3 hours post-ECT (T4). Testing was simple and brief, taking about 5 minutes in total. Inter-rater reliability was checked using clinical staff. These tests are used routinely in the Movement Disorders Clinic at Kingston Centre and are safely performed in patients with severe physical disability.[26]

Steady standing test

This task measures a patient's ability to control the body during upright stance without hand support. Stance positions included: (a) feet 10 cm apart; (b) feet together; (c) stride stance, with feet placed 10 cm apart and with the heel of the front foot in line with the toes of the rear foot; (d) tandem stance, with one foot directly in front of and contacting the other; and (e) single leg stance, with the nonweight bearing leg held at 45° knee flexion and the hip in neutral flexion and 5° abduction. Footprint templates were used to guide patients. Stride stance and tandem stance were tested with the right and then the left foot forward. Single limb stance duration was also recorded for both feet. Each test concluded if the position was maintained for 30 seconds or if subjects changed stance position or required external support.[26,27]

Perturbation of standing balance by self-initiated movements

These tests are well-suited to assessing postural control during functional activity. They measure the ability of the postural control system to activate anticipatory responses to withstand potentially destabilizing perturbations produced by displacement of the patient's own body. Thus slowness in repeatedly raising the arm or making stepping movements may be due to delays in the anticipatory postural activity required to stabilize upright stance during these dynamic activities.[27–29]

Arm Raise Test: Subjects stood with their feet 10 cm apart on foot templates and were instructed to "Lift your arm up and down to shoulder height as many times as you can in 15 seconds when I say go." The tester passively demonstrated 90° flexion of the subject's arm. Both arms were tested. The number of repetitions completed in 15 seconds was recorded.[26,27]

Step Test: Subjects stood with their feet 10 cm apart on foot templates, with a 15 cm high step positioned 5 cm in front of their toes, and were instructed as follows: "When I say go, step as many times as you can until I say stop. Make sure that the whole of your foot contacts the step each time." Both feet were tested. The number of times the foot was placed fully onto the step in 15 seconds was recorded.[26,30]

Perturbation of standing balance by an external perturbation (shoulder tug test)

This test measures a patient's ability to control upright stance in response to an external perturbation to the center of mass.[27,31] Subjects were positioned with their feet 10 cm apart. The examiner stood directly behind the subject, stating: "I am going to tap you and I won't let you fall." The direction and timing of the perturbation were not mentioned. The shoulder was then briefly tugged in a posterior direction with sufficient force to destabilize the subject. Postural reactions were rated using the following 5-point scale: 1 = staying upright without taking a step; 2 = one step backwards but remaining steady; 3 = more than one step backwards but remaining steady; 4 = one or more steps backwards, followed by the need to be caught; and 5 = falling backwards without attempting to step.[26,32]

Timed up and go test

This test measures basic functional mobility in frail older adults. A chair with armrests was positioned 3 meters away from a marker on the floor. Subjects were seated with their backs against the chair and their arms on the armrests. They wore their usual footwear and were not physically assisted.

Subjects were then instructed to stand on the command "go", walk to the floor marker at a comfortable and safe pace, turn around, return to the chair, and sit down again. Following a trial run, the time taken was recorded.[33]

Study design and statistical analyses

A prospective, repeated measures study design was used to assess changes in balance and gait before and after a single ECT treatment. One-way repeated measures analysis of variance (ANOVA) was undertaken using IBM SPSS Statistics 20 (IBM Corporation, Somers, NY, USA). The observed power of each ANOVA, as calculated using SPSS, is reported in our results tables. To guide researchers regarding the number of participants that would be required for a more definitive future study (with 80% power, an alpha level of 5% and a medium effect size of 0.25),[34] we also performed a priori power analysis (sample size calculation) based on our pilot data using G*Power 3.1.5 software.[35,36]

Results

Tables 1 and 2 summarize clinicodemographic characteristics of study participants and ECT treatment parameters respectively. Twice as many women (14) participated compared to men (7). Only one (male) participant had bipolar depression. On average, patients had been depressed for 7.2 months and were prescribed psychiatric medications from two different classes. Furthermore, they had 2.1 comorbid medical conditions and took 3.6 nonpsychiatric medications on average. Only one patient had a past history of falls, with the last fall occurring six months previously. Mean Barthel Index and MMSE scores (and associated standard deviations, SD) prior to treatment were 96 (SD = 9.7) and 26 (SD = 4.0) respectively, indicating good performance of activities of daily living (including mobility) and cognitive functioning. The mean HAMD score was 17 (SD = 9.8) among patients receiving acute ECT and 6 (SD = 5.9) among patients receiving maintenance treatment.

Table 1 Patient demographic and clinical characteristics

Age	
Years (M, SD)	75.6 (5.7)
Number aged 65–74 years	7
Number aged 75+ years	14
Medical conditions (number of patients)	
Cardiovascular	18
Respiratory	3
Neurological	4
Musculoskeletal	8
Metabolic/endocrine	7
Hematological	2
Urinary	2
Non-psychiatric medications (number of patients)	
Antihypertensive	16
Hypoglycemic	1
Antiarrhythmic	3
Other	19
Psychiatric medications (number of patients)	
Antidepressant	18
Mood stabilizer	1
Antipsychotic	11
Benzodiazepine	3
Hypnotic	8

Abbreviations: M, mean; SD, standard deviation.

Table 2 ECT treatment parameters

ECT type (no of patients)	
Acute	14
Maintenance	7
Electrode placement (no of patients)	
Right unilateral	11
Bitemporal	5
Bifrontal	5
ECT treatment dose	
Mean Thymatron® percent energy	85.5
Mean millicoulombs	430.9
EEG seizure duration	
Mean seconds	42.4
Average seizure energy index	
Mean value	4403.1
Postictal suppression index	
Mean percentage	51.3

Abbreviation: ECT, electroconvulsive therapy.

Results of balance and gait testing (including means and SDs for each measure across all time points), one-way repeated measures ANOVAs and power analyses are presented in Tables 3 to 6. Among all these tests, the only item for which a statistically significant effect for time was found was the left arm raise test, undertaken as part of perturbation of standing balance by self-initiated movement (Wilks' Lambda = 0.64, F (3, 18) = 3.42, $P < 0.05$, multivariate partial eta squared = 0.36). However the observed increase in mean number of repetitions from 7.81 at T2 to 8.81 at T4 was in the opposite direction to what might be expected if ECT was having a detrimental effect on balance.

Discussion

While this pilot study is novel in its aim of testing patients for ECT-related balance and gait abnormalities, it has several limitations. We could only recruit 21 patients, resulting in suboptimal observed power for uncovering positive associations, ranging from 6.5% to 52.8% for different tests with nonsignificant findings. Achieving even this modest number proved exceptionally difficult, with many older

Table 3 Steady standing test: results of testing, one-way repeated measures ANOVAs and power analyses

Test item	Test results (N, M, SD)	ANOVA results	Power analyses*
Feet 10 cm apart	T1 (21, 30.00, 0)	No change over time	
	T2 (21, 30.00, 0)		
	T3 (21, 30.00, 0)		
	T4 (21, 30.00, 0)		
Feet together	T1 (21, 30.00, 0)	No change over time	
	T2 (21, 30.00, 0)		
	T3 (21, 30.00, 0)		
	T4 (21, 30.00, 0)		
Stride stance – left foot forward	T1 (21, 29.86, 0.66)	No significant effect for time	22.7%, 305
	T2 (21, 29.50, 2.29)	Wilks' $\lambda = 0.86$, F (3, 18) = 1.0, $P = 0.415$	
	T3 (21, 28.90, 5.02)	Multivariate partial eta squared = 0.14	
	T4 (21, 30.00, 0)		
Stride stance – right foot forward	T1 (21, 28.52, 4.81)	No significant effect for time	28.2%, 378
	T2 (21, 29.95, 0.22)	Wilks' $\lambda = 0.86$, F (2, 19) = 1.52, $P = 0.245$	
	T3 (21, 30.00, 0)	Multivariate partial eta squared = 0.14	
	T4 (21, 30.00, 0)		
Tandem stance – left foot forward	T1 (21, 15.37, 13.28)	No significant effect for time	11.0%, 176
	T2 (21, 14.65, 12.90)	Wilks' $\lambda = 0.94$, F (3, 18) = 0.38, $P = 0.771$	
	T3 (21, 16.71, 13.09)	Multivariate partial eta squared = 0.06	
	T4 (21, 14.69, 13.46)		
Tandem stance – right foot forward	T1 (21, 19.81, 12.42)	No significant effect for time	24.7%, 187
	T2 (21, 17.65, 11.70)	Wilks' $\lambda = 0.85$, F (3, 18) = 1.10, $P = 0.376$	
	T3 (21, 15.67, 11.74)	Multivariate partial eta squared = 0.16	
	T4 (21, 14.26, 12.09)		
Single leg stance – left leg	T1 (20, 6.93, 7.59)	No significant effect for time	23.4%, 271
	T2 (20, 7.34, 9.01)	Wilks' $\lambda = 0.84$, F (3, 17) = 1.05, $P = 0.397$	
	T3 (20, 7.83, 9.57)	Multivariate partial eta squared = 0.16	
	T4 (20, 6.05, 7.78)		
Single leg stance – right leg	T1 (20, 7.11, 6.83)	No significant effect for time	10.2%, 176
	T2 (20, 7.97, 10.85)	Wilks' $\lambda = 0.94$, F (3, 17) = 0.34, $P = 0.799$	
	T3 (20, 8.71, 10.25)	Multivariate partial eta squared = 0.06	
	T4 (20, 9.08, 10.39)		

Notes: *The first value shows the observed power of this pilot study. The second value shows the sample size required for a future prospective study to detect a medium effect size (f(V) = 0.25), with 80% power and an alpha level of 5%, based on 1 group with 4 measurements (1 pre, 3 post), using the non-sphericity correction from the pilot study for that outcome.

Abbreviations: ANOVA, analysis of variance; ECT, electroconvulsive therapy; N, number of participants; M, mean rating; SD, standard deviation; T1, 1 hour pre-ECT; T2, 1 hour post-ECT; T3, 2 hours post-ECT; T4, 3 hours post-ECT.

ECT recipients being either incapable of consenting to study participation or lacking the energy and motivation to complete even brief bedside tests due to depression severity. For ethical reasons, our study excluded the very patients that may be at most risk of falling following ECT – those with clinically overt mobility problems that impaired their ability to undergo testing or unduly increased the risk of test-related falls. Despite these recruitment problems, 14 of our patients were aged 75 years and over and were thus comparable in age to patients included in prior studies of ECT safety in the very old.[2,3,17] In keeping with a higher prevalence of depression among women, there was a preponderance of women among study participants. While we examined balance and gait before and after ECT in a structured way, and gathered information regarding past falls history, we did not collect data on whether patients went on to have falls after ECT. Furthermore, although cognitive side effects of ECT are more likely in older individuals, our only measure of cognition was a pretreatment MMSE score.

Additional limitations stem from differences in the timing of testing and electrode placement. Participants were tested at different times in the course of either acute or maintenance ECT. This might be important if ECT has diminishing or cumulative effects on balance and gait over time. The severity of depressive symptoms varied widely in range, in part due to differences in the timing of testing. Also, three different electrode placements were used. In all, our small patient numbers and negative results precluded further meaningful examination of whether these factors influenced test performance.

Methodological factors regarding test selection and implementation may have also influenced results. To make

Table 4 Perturbation of standing balance by self-initiated movement: results of testing, one-way repeated measures ANOVAs and power analyses

Test item	Test results (N, M, SD)	ANOVA results	Power analyses*
Arm raise test – left arm	T1 (21, 7.81, 2.50) T2 (21, 7.81, 2.68) T3 (21, 8.29, 2.22) T4 (21, 8.81, 2.50)	Significant effect for time Wilks' $\lambda = 0.64$, F (3, 18) = 3.42, $P < 0.05$ Multivariate partial eta squared = 0.36	67.0%, 248
Arm raise test – right arm	T1 (21, 8.33, 2.52) T2 (21, 8.67, 2.92) T3 (21, 8.76, 2.28) T4 (21, 9.43, 2.38)	No significant effect for time Wilks' $\lambda = 0.70$, F (3, 18) = 2.54, $P = 0.089$ Multivariate partial eta squared = 0.30	52.8%, 240
Step test – left foot	T1 (20, 7.40, 2.33) T2 (20, 7.30, 2.74) T3 (20, 7.35, 2.28) T4 (20, 7.50, 1.99)	No significant effect for time Wilks' $\lambda = 0.98$, F (3, 17) = 0.10, $P = 0.957$ Multivariate partial eta squared = 0.02	6.5%, 186
Step test – right foot	T1 (20, 7.65, 2.18) T2 (20, 7.35, 2.96) T3 (20, 7.70, 2.54) T4 (20, 7.80, 2.59)	No significant effect for time Wilks' $\lambda = 0.92$, F (3, 17) = 0.47, $P = 0.710$ Multivariate partial eta squared = 0.08	12.5%, 176

Notes: *The first value shows the observed power of this pilot study. The second value shows the sample size required for a future prospective study to detect a medium effect size (f(V) = 0.25), with 80% power and an alpha level of 5%, based on 1 group with 4 measurements (1 pre, 3 post), using the non-sphericity correction from the pilot study for that outcome.

Abbreviations: ANOVA, analysis of variance; ECT, electroconvulsive therapy; N, number of participants; M, mean rating; SD, standard deviation; T1, 1 hour pre-ECT; T2, 1 hour post-ECT; T3, 2 hours post-ECT; T4, 3 hours post-ECT.

findings clinically applicable, we selected simple but reliable testing procedures not requiring specialized equipment. Mean scores on static tests (feet together, feet 10 cm apart and the stride stance components of the steady standing test) were consistently high, indicating a ceiling effect. These tests may have been insufficiently demanding to differentiate patients with and without balance problems in our sample. A possible learning effect was apparent on the left arm raise test, with an increase in the mean number of repetitions over 15 seconds being recorded over time. This raises the question of whether other test scores should have also improved with repeated performance and whether lack of improvement is itself clinically noteworthy. Alternatively, the presence of an isolated positive finding among multiple negative comparisons may be due to a Type 1 error.

The above limitations make it difficult to draw definitive conclusions as to whether falls occurring in the context of ECT are mediated by treatment-related disturbances in balance and gait. It may be postulated on the basis of our findings that ECT does not give rise to intrinsic abnormalities in balance and gait – or that any problems are offset by improvements in mood and functional level – and that this is accurately reflected in our data. Supporting this notion is experience with ECT use in patients with Parkinson's disease, where ECT has been used to temporarily attenuate core motor symptoms.[37]

Despite these observations, we do not wish to convey the impression that falls do not occur following ECT in older adults. We have encountered post-ECT falls in our clinical practice and their occurrence is verified by research.[1–3,14–17,19,20] One possible explanation for this discrepancy is that we have focused on the wrong construct in trying to detect the emergence of subtle balance and gait and abnormalities following ECT, with other factors being more important in promoting falls in this setting. Gschwind et al[38] note that almost all falls in older people occur while walking and that concurrent performance of a cognitive or

Table 5 Perturbation of standing balance by external perturbation: results of testing, one-way repeated measures ANOVA and power analyses

Test item	Test results (N, M, SD)	ANOVA results	Power analyses*
Shoulder tug test	T1 (20, 2.00, 1.59) T2 (20, 1.90, 1.41) T3 (20, 2.15, 1.50) T4 (20, 1.70, 1.26)	No significant effect for time Wilks' $\lambda = 0.84$, F (3, 17) = 1.06, $P = 0.394$ Multivariate partial eta squared = 0.16	23.6%, 178

Notes: *The first value shows the observed power of this pilot study. The second value shows the sample size required for a future prospective study to detect a medium effect size (f(V) = 0.25), with 80% power and an alpha level of 5%, based on 1 group with 4 measurements (1 pre, 3 post), using the non-sphericity correction from the pilot study for that outcome.

Abbreviations: ANOVA, analysis of variance; ECT, electroconvulsive therapy; N, number of participants; M, mean rating; SD, standard deviation; T1, 1 hour pre-ECT; T2, 1 hour post-ECT; T3, 2 hours post-ECT; T4, 3 hours post-ECT.

Table 6 Timed up and go test: results of testing, one-way repeated measures ANOVA and power analyses

Test item	Test results (N, M, SD)	ANOVA results	Power analyses*
Timed up and go test	T1 (21, 12.19, 3.61) T2 (21, 12.56, 3.22) T3 (21, 12.76, 4.45) T4 (21, 11.80, 3.56)	No significant effect for time Wilks' $\lambda = 0.72$, F (3, 18) = 2.31, $P = 0.111$ Multivariate partial eta squared = 0.28	48.7%, 200

Notes: *The first value shows the observed power of this pilot study. The second value shows the sample size required for a future prospective study to detect a medium effect size (f(V) = 0.25), with 80% power and an alpha level of 5%, based on 1 group with 4 measurements (1 pre, 3 post), using the non-sphericity correction from the pilot study for that outcome.

Abbreviations: ANOVA, analysis of variance; ECT, electroconvulsive therapy; T1, 1 hour pre-ECT; T2, 1 hour post-ECT; T3, 2 hours post-ECT; T4, 3 hours post-ECT; N, number of participants; M, mean time (seconds); SD, standard deviation.

motor activity may cause gait disturbance and increase the risk of falls. In applying these observations to understanding our present findings, it is possible that falls occurring after ECT are unrelated to any directly deleterious effect of treatment upon balance and gait. Rather, ECT-related cognitive impairment may be a mediator of falls,[9,10] in keeping with our clinical observation that some patients who fall in this context are experiencing post-ECT confusion. The severity of a patient's primary psychiatric condition may play a similar intermediary role. For example, marked apathy or psychosis related to depression may increase the risk of falls through carelessness or inattention, impaired judgment or decreased concern about personal safety.

Indeed, there is emerging evidence from the general falls prevention literature to support this postulated link between cognitive impairment and post-ECT falls. In a randomized controlled trial of patient education for falls prevention among medical and surgical inpatients, positive outcomes were achieved in patients with intact (but not impaired) cognitive function.[39] More recently, Mirelman et al[40] demonstrated that the risk of future falls among community living older adults could be predicted by performance on executive and attention testing 5 years earlier. From an ECT practice perspective, these findings emphasize the importance of using modern, evidence-based techniques (incorporating dose titration and seizure threshold determination as a basis for individualized, suprathreshold stimulus dosing) to maximize therapeutic efficacy whilst minimizing cognitive sequelae.[11]

For any ECT falls risk assessment to be clinically relevant, it should be easy to routinely implement and immediately interpret on a patient-by-patient basis. Whether large scale balance and gait testing in ECT practice would be feasible, and then translate into clinically significant falls prevention outcomes, remains open to question. For the present screening tests to detect significant findings, sample sizes ranging from 176 to 378 patients for different tests may be necessary (according to a priori power analysis of our pilot data). Testing so many patients may be impractical from both a research and clinical perspective. Techniques such as video gait analysis[41,42] and computerized dynamic posturography[43–45] may be more sensitive than screening tests in detecting subtle gait and balance disturbances following ECT. It is uncertain, however, how this line of research would advance clinical ECT practice, as most ECT practitioners will not have access to sophisticated motion analysis systems available only in dedicated gait laboratories.

Given the recruitment difficulties encountered in the present prospective pilot study, a more viable approach to better understanding and preventing ECT-related falls in older adults may be to study patients who have actually fallen in the context of ECT. A retrospective rather than experimental study design may be more suitable (ethically and practically) for examining such high risk patients. Given the potential contribution of cognitive side effects and psychiatric symptomatology to ECT-related falls, we recommend their routine evaluation using structured instruments at regular intervals during treatment. Systematic availability of this information is invaluable for auditing, quality assurance and research applications aimed at better identifying risk factors for falls and developing rational clinical guidelines for falls prevention in ECT practice.

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Disclosure

The authors report no conflicts of interest in this work, and are alone responsible for the content and writing of this paper.

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