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The place for electroconvulsive therapy in the management of behavioral and psychological symptoms of dementia

Rajesh R Tampi^{*,1,2} , Deena J Tampi³, Juan Young⁴, Rakin Hoq⁵ & Kyle Resnick⁵

¹Department of Psychiatry & Behavioral Sciences, Cleveland Clinic Akron General, Akron, OH 44307, USA

²Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH 44195, USA

³Diamond Healthcare, Richmond, VA 23219, USA

⁴Department of Psychiatry, Yale School of Medicine, New Haven, CT 06510, USA

⁵Summa Health Systems/NEOMED Psychiatry Residency Program, Akron, OH 44304, USA

*Author for correspondence: Tel.: +1 203 809 5223; Fax: +1 330 344 2943; rajesh.tampi@gmail.com

“ECT appears to be a safe treatment among older adults with few contraindications and transient or limited number of adverse effects”

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The term ‘behavioral and psychological symptoms of dementia’ (BPSD) is used to describe a group of non-cognitive symptoms and behaviors that are commonly seen among individuals with dementia. BPSD occurs among a third to three-quarters of individuals with dementia, with greater prevalence seen among individuals living in institutional settings [1]. In addition to causing significant emotional distress to the individuals with dementia and their caregivers, BPSD is also associated with significant negative effects including a decline in cognition and function among individuals with dementia, lower the quality of life for individuals with dementia and their caregivers, greater rates of institutionalization for individuals with dementia and greater financial burden to the families of individuals with dementia and the society in general [1].

Available evidence indicates that both non-pharmacological and pharmacological interventions are beneficial for the management of BPSD [2]. Pharmacotherapy is usually reserved for those symptoms or behaviors that are refractory to non-pharmacological interventions. In addition, pharmacotherapy is typically used in combination with non-pharmacological interventions for the management of BPSD. Caregiver and staff education along with cognitive stimulation appears to have sustained benefits in the management of BPSD [3]. Current evidence indicates efficacy for antidepressants, anticonvulsants, antipsychotics and cholinesterase inhibitors for the management of BPSD. However, the use of psychotropic medications, especially antipsychotics, for management of BPSD has come under scrutiny due to their significant adverse effects, including cerebrovascular adverse events and death [4].

Electroconvulsive therapy (ECT) is an important treatment tool among older adults with psychiatric disorders [5–7]. Evidence indicates efficacy for ECT in the treatment of depression, mania, psychosis and catatonia. It has been found to be highly effective in emergency situations like malignant catatonia, depression with psychotic or catatonic features and among individuals with threatening suicidal behaviors. ECT also appears to have greater benefit among older adults when compared with younger adults [6]. In addition, ECT appears to be a safe treatment among older adults with few contraindications and transient or limited number of adverse effects.

Over the past two decades, there has been growing interest in using ECT among individuals with BPSD [8]. In this article, we review the evidence for using ECT in the management of BPSD. Based on the available evidence, we make recommendations on when the use of ECT is appropriate among individuals with BPSD. We searched the databases PubMed and Ovid Medline using two keywords: ‘ECT’ and ‘dementia’. In addition, we also reviewed the references of included studies for additional papers. We only included published studies that evaluated the use of ECT for BPSD in this report, irrespective of the type of study.

Evidence for using ECT in the management of BPSD

A review of the literature indicates that there are 20 published reports on the use of ECT for the management of BPSD [9–28]. These reports included a total of 172 individuals with dementia. A majority of these studies were case reports (eight of 20, 40%) followed by retrospective chart reviews (five, 25%) and case series (four, 20%). There was only one prospective cohort study [23], one case–control study [24] and one prospective observational study [27]. A majority of the individuals had Alzheimer’s disease (68 of 172, 40%) followed by unspecified dementia (25, 15%) and vascular dementia (22, 13%). Bitemporal followed by right unilateral and bilateral were the most common electrode placements. Twelve of the studies (60%) were reported from the US followed by four from Canada and one each from The Netherlands, Germany, Italy and China. It appears that over 90% of the individuals who were treated with ECT responded to treatment with a resolution of target symptoms including verbal and physical aggression and suicidal behaviors. Adverse effects from the ECT were infrequent and when they did occur, were mild and transient. The most common adverse event that was reported was postictal confusion/memory impairment in approximately 25 (15%) of the individuals. Table 1 provides details of these published papers obtained via a literature search.

Although the therapeutic mechanism of ECT is unclear, it is postulated that ECT benefit individuals with BPSD by enhancing the transmission of neurochemicals including GABA, glutamate, dopamine and norepinephrine in the brain [29–33].

Two recent systematic reviews have evaluated the literature on the use of ECT for the management of BPSD. In the first review, Glass *et al.* found 11 papers that included a total of 216 individuals with BPSD who were treated with ECT [34]. The authors reported that despite being limited to case reports, case series, retrospective chart review, retrospective case–control and an open-label prospective study, ECT demonstrated promise in reducing agitation among individuals with dementia. Additionally, in those individuals who had a relapse in symptoms, they found benefit from maintenance ECT. In the second systematic review by van den Berg *et al.*, the authors found 17 reports that evaluated the use of ECT among individuals with BPSD [35]. The investigators reported that they found one prospective cohort study and one case–control study, whereas the others were retrospective chart reviews, case series or case reports. They reported that clinically significant improvement was observed in 88% of the 122 individuals in these studies and the effect was often noted early in the treatment course. Additionally, the adverse effects were most often mild, transient or not reported.

Two recent reports also indicate that ECT does not increase the risk of dementia [36,37]. Additionally, there is no evidence that ECT worsens cognition among individuals with dementia [38–40].

The findings of this report are similar to the two above-mentioned systematic reviews. There is emerging evidence that ECT appears to be beneficial in treating individuals with BPSD and is fairly well tolerated. However, the major limitations of available data are as mentioned in the two systematic reviews – there is substantial risk of selection bias in these studies, the study designs are not randomized controlled trials, and there are a limited number of studies with few participants available in the literature.

Place for using ECT in the management of BPSD

Based on the available evidence from a search of the literature, it is our opinion that ECT appears to be a viable treatment option for individuals with BPSD. It appears to be particularly suited for use among individuals who have had an inadequate response to non-pharmacological and pharmacological treatment strategies, among those individuals who have tolerability issues to pharmacotherapy, and also among those individuals in whom there is a need for the quick resolution of symptoms for their safety and well being.

We agree with Burgut *et al.* who caution that the decision to use ECT among individuals with BPSD should be done after a thoughtful review of all available treatment options [8]. The authors remind us that the use of ECT among individuals with BPSD would be an ‘off-label’ indication. They further caution us that ECT remains a controversial treatment in medicine, not due to any clinical or scientific evidence regarding its efficacy and safety, but due to societal misperception about its use among patients with mental health disorders. The authors recommend the use of ECT among individuals with BPSD only when all other treatment options have failed, and with the informed consent of the individual with dementia or their surrogate decision makers who are fully apprised of the potential risks of the treatment. The authors also recommend ongoing risk–benefit analysis of the treatment trial to maximize gains and reduce harm from the ECT treatments.

Table 1. Summary of published studies on the use of electroconvulsive therapy for the management of behavioral and psychological symptoms of dementia.

Study (year)	Country	Type of study	Number of patients	Type of patients	Type of ECT	Target behaviors	Outcomes	Adverse effects	Ref.
Carlyle <i>et al.</i> (1991)	Canada	Case series	3	Dementia, type not specified	Bilateral	Verbal aggression (disruptive vocalizations)	Improvement in symptoms	None reported	[9]
Holmberg <i>et al.</i> (1996)	USA	Case report	1	Dementia, type not specified	Bilateral	Verbal and physical aggression	Improvement in symptoms	None reported	[10]
Roccaforte <i>et al.</i> (2000)	USA	Case report	1	Dementia, type not specified	Not stated	Verbal aggression (disruptive vocalizations)	Improvement in symptoms	None reported	[11]
Grant <i>et al.</i> (2001)	USA	Case series	4	AD	Bilateral	3 – verbal and physical aggression 1 – verbal aggression	Improvement in symptoms	None reported	[12]
Reid (2006)	USA	Case report	1	Pick's disease	Not stated	Verbal and physical aggression	No benefit	None stated	[13]
Sutor <i>et al.</i> (2008)	USA	Retrospective chart review	11	AD	8 – bitemporal 2 – right unilateral 1 – bifrontal	Verbal and physical aggression	Nine of 11 showed improvement in symptoms	7 – no adverse effects noted 2 – decreased cognition 1 – somnolence and atrial fibrillation requiring cardioversion 1 – urinary retention	[14]
Bang <i>et al.</i> (2008)	USA	Case reports	2	1 – AD and Parkinson's disease 1 – congenital hydrocephalus	Bilateral	Verbal aggression (disruptive vocalizations)	Improvement in symptoms	None noted	[15]
Wu <i>et al.</i> (2010)	USA	Case reports	2	1 – AD 1 – FTD	Bitemporal	Physical aggression	Improvement in symptoms	None noted	[16]
Ujkaj <i>et al.</i> (2012)	USA	Retrospective chart review	16	8 – AD 3 – VD 2 – FTD 3 – unspecified dementia	12 – bilateral 4 – right unilateral	Verbal and physical aggression	15 of the 16 patients showed improvement in symptoms	8 – transient postictal confusion 2 – more severe postictal confusion No other serious adverse effects noted	[17]
Kramer <i>et al.</i> (2013)	The Netherlands	Case series	3	AD	Bilateral	Verbal and physical aggression	Improvement in target behaviors	No serious adverse effects noted	[18]
Aksay <i>et al.</i> (2014)	Germany	Case report	1	AD	Right unilateral	Verbal and physical aggression	Improvement in target behaviors	No serious adverse effects noted, headaches after first three sessions	[19]
Tang <i>et al.</i> (2014)	USA	Retrospective chart review	42	Dementia, type not specified	Right unilateral and bifrontal	Agitation	Not noted in the abstract	Not noted in the abstract	[20] (Abstract only)
Dare <i>et al.</i> (2015)	USA	Case series	1	AD	Bilateral and right unilateral	Behavioral dyscontrol	Improvement in target behaviors	None noted	[21]
Fàzzari <i>et al.</i> (2015)	Italy	Case report	1	AD	Bifrontal and bitemporal	Restlessness, mood lability and verbal aggression	Improvement in target behaviors	None noted	[22]

AD: Alzheimer's disease; BPSD: Behavioral and psychological symptoms of dementia; ECT: Electroconvulsive therapy; FTD: Frontotemporal dementia; LBD: Lewy body dementia; VD: Vascular dementia.

Table 1. Summary of published studies on the use of electroconvulsive therapy for the management of behavioral and psychological symptoms of dementia (cont.).

Study (year)	Country	Type of study	Number of patients	Type of patients	Type of ECT	Target behaviors	Outcomes	Adverse effects	Ref.
Acharya <i>et al.</i> (2015)	USA	Prospective cohort study	23	13 – AD 4 – VD 1 – FTD 2 – mixed dementia 3 – unspecified dementia	Right unilateral and bifrontal	Agitation or aggression	21 out of the 23 participants responded to treatment with improvement in symptoms	21 out of the 23 participants tolerated the treatments well, two participants developed post ECT delirium, one participant developed atrial fibrillation but continued to receive ECT	[23]
Zhang <i>et al.</i> (2016)	China	Case-control study	23	8 – AD 8 – VD 4 – FTD 3 – unspecified dementia	Bitemporal	16 – high risk for suicide 6 – high risk for aggression 1 – insufficient response to pharmacotherapy or intolerable adverse effects	21 out of the 23 participants responded to treatment with improvement in symptoms	7 – transient memory impairment 1 – headache 1 – myalgia 1 – mild dyspnea 1 – transient hypertension	[24]
Isserles <i>et al.</i> (2017)	Canada	Retrospective chart review	25	11 – AD 5 – VD 4 – LBD 3 – FTD 9 – unspecified dementia 3 – mixed (A + VD)	Bitemporal Right unilateral to bitemporal-3 Bitemporal to right unilateral-1	Severe and resistant BPSD	72% – marked response for acute treatment course 87% – marked response for maintenance course	Clinical note 7% – significant cognitive adverse effects in acute course 13% – significant cognitive adverse effects in the maintenance course Attending psychiatrist score 21% – significant cognitive adverse effects	[25]
Lau <i>et al.</i> (2017)	Canada	Retrospective chart review	5	3 – AD 2 – mixed dementia (AD + VD)	Bitemporal	Verbal aggression (disruptive vocalizations)	Improvement in target behaviors ($p < 0.0001$)	1 – transient post ECT delirium	[26]
Burton <i>et al.</i> (2017)	USA	Prospective observational study	6	3 – AD 2 – VD 1 – unspecified dementia	Bitemporal	Severe behavioral disturbances	Improvement in target behaviors	0 – adverse events necessitating ECT discontinuation. 1 – post-ECT nausea, remitted with intravenous ondansetron 1 – post-emergence agitation, resolved with intravenous diazepam	[27]
Selvadurai <i>et al.</i> (2018)	Canada	Case report	1	Frontolobar degeneration	Bitemporal	Physical aggression and inappropriate sexual behaviors	Improvement in target behaviors	None reported	[28]

AD: Alzheimer's disease; BPSD: Behavioral and psychological symptoms of dementia; ECT: Electroconvulsive therapy; FTD: Frontotemporal dementia; LBD: Lewy body dementia; VD: Vascular dementia.

Conclusion & future perspective

As the available evidence for the use of non-pharmacological treatment modalities for the management of BPSD is strong, additional well-controlled and larger trials on the use of such treatments are expected in the near future. Given the strength of existing evidence, regulatory authorities will require that non-pharmacological treatment modalities must be tried among individuals with BPSD, before embarking on pharmacotherapeutic trials given the concern over adverse-effect profiles of these medications. There is growing literature on the use of ECT for

the management of BPSD. Available evidence indicates that ECT is effective and well tolerated among individuals with BPSD. However, the evidence is limited to uncontrolled trials and to a limited number of individuals. As there is significant concern for the use of pharmacotherapeutic agents among individuals with BPSD, and the evidence for the use of ECT among individuals with BPSD is growing, well controlled and larger trials of the use of ECT for the management of BPSD can be anticipated in the near future. If the evidence from these new trials is robust and confirms the findings that ECT is well tolerated and beneficial to individuals with BPSD, ECT will have a definitive place among management strategies for BPSD. However, given the public perception of ECT, it is difficult to envisage the use of ECT among individuals with BPSD except in refractory cases or in cases where the response to other treatments is slow or limited by tolerability issues.

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