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Vagus nerve stimulation in patients with Alzheimer's disease

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Dear Editor,

Alzheimer's disease (AD) is a devastating, progressive condition associated with memory and cognitive disturbances, mood swings and behavioral changes, and the quality of life reduction (1). AD is the most common cause of dementia in person older than 65 years, with 1 in 10 older than 65 years afflicted and half among those older than 85 years afflicted. More than 4.5 million persons are currently affected in the United States by AD, and is expected to nearly triple by the year 2050 in the absence of preventive treatments (2).

AD is pathologically characterized by the accumulation of amyloid plaques and tau-associated neurofibrillary tangles (3). Patients with AD have increased cerebrospinal fluid (CSF) levels of tau protein and decreased CSF levels of β-amyloid.

Although, patients with AD experience significant elevations in CSF tau levels, CSF tau levels have been shown to remain stable over extended periods of time (4). Several neurotransmitter systems are pathologically altered in AD. Cholinergic neurons in the nucleus basalis of Meynert degenerate early in the course of the disease.

These neurons provide wide spread projections to the association cortices, and loss of acetlycholine is the mechanistic basis for cholinesterase inhibition in AD treatment. Glutamatergic function also is disregulated in AD, with inhibition of the pathological stimulation of the NMDA receptor providing the scientific rationale for the mechanism of the noncompetitive glutamate antagonist, memantine.

In addition to the atrophy of the basal forebrain cholinergic system, marked neuronal loss occurs within the locus ceruleus and the raphe nucleus in AD (5). Significant reduction of norepinephrine in the temporal cortex occur in AD and correlates with the degree of cognitive impairment (6).

Disturbances in serotonin metabolism also have been reported in AD (7). The U.S. Food and Drug Administration (FDA) had approved 5 drugs (tacrine, donepezil, rivastigmine, and galantamine) for the treatment of AD (8).

None of these treatments have been shown to modify the disease process in patients with AD, but they provide benefit to the patient, family, and caregivers by slowing the patient's progressive decline.

Vagus nerve stimulation (VNS) has been shown to activate the locus ceruleus (9) and to increase norepinephrine (10) output into the basolateral amygdala and hippocampus in animal models.

Activation of the raphe nucleus with VNS also has been recently demonstrated (11). Merill et al reported cognitive-enhancing effects of VNS during the first 6 months of treatment in a small pilot study of 10 patients with AD (12). Later, they published a follow-up report including additional 7 patients, with for at least 1 year for all 17 patients.

Vagus nerve stimulation method promising new powerful alternative approaches in some neurological disorders especially in the treatment of refractory epilepsy (13).

In this clinical research, 14 patients with Alzheimer's disease who were treated with VNS were reviewed and the results were assed in the light of the literature. Only first and second phase of AD patients were included in the study. In total 14 AD patients (7 man and 7 women aged between 68 and 82 year old) participated in this study. Patients were followed up for one year.

As soon as each implant was activated (two weeks after the implantation) attention of patients dramatically were improved, progressively going better On the other hand, 3 patients, who had difficulty in speaking along AD, improved by the VNS their talk within 3 months.

According to our observed preliminary results, a new therapy potential is arising struggling against Alzheimer diseases.

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