LETTER TO THE EDITOR

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Atrophy is a Real Phenomenon that Can Result in Changes in Deep Brain Stimulation Outcome

To the Editor

We read the case report by Choi et. al. with great interest and would like to add to their observations and to lend strong support to the notion that atrophy impacts DBS outcome. Our experience was previously published in PLOSONE in 2014 but not cited in their report, and we think important for the readership to be aware of this phenomenon.[1] Choi reported a 57-year old man who underwent bilateral thalamic DBS surgery for refractory epilepsy and had worsening of seizures following 8 years of reasonable seizure control. This exacerbation of symptoms was attributed to a lead migration into the third ventricle caused by significant ventricular enlargement and atrophy. Re-implantation of a new DBS lead revealed a clinically significant improvement.

We agree with the authors that brain atrophy as a potential cause of lead migration leading to a loss of benefit from DBS is possible and should be a worrisome issue. DBS-induced side effects can also result from this phenomenon. We previously reported two Parkinson's disease and one Essential Tremor patient with an unexpected loss of benefit and/or appearance of new side effects from DBS following several years of clinical benefit.[2] Our patients underwent a DBS troubleshooting protocol and careful examination of the implantable pulse generator as well as a careful examination of the electrical system integrity (e.g. impedance and current drain). There were further studies of the DBS system with plain x-rays and no relevant issues were uncovered. We reviewed serial brain imaging studies inclusive of lead locations. We observed a substantial increase in brain atrophy indices (3rd ventricular width, Evans index, ventricular index, and cella media index) and also observed a relative lateral migration of the leads when compared to previous imaging examinations. The likely cause was atrophy which changed the relationship of the DBS leads over time to the surrounding neuroanatomical structures (i.e. a lead may be closer to the internal capsule and may more easily evoke side effects).

There is pathological and imaging evidence that the brain changes with age, and that the most prominent changes have been in the frontal cortex, the temporal cortex, the putamen, the thalamus, and the nucleus accumbens though other regions are also at risk.[3] We have now encountered another interesting case of shifting DBS leads due to atrophy. This case included serial brain scans and a post-mortenm pathological analysis in a Huntington's disease patient with bilateral globus pallidus internus DBS. In this case, a change in lead position was observed over time (case has been accepted for publication and publication is pending). Atrophy is a real phenomenon

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that DBS clinicians should pay attention to as it could affect the long-term DBS outcome.

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