Histological Evaluation of Neuroinflammation Near a DBS Electrode Implanted for 16 Years

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Introduction

Deep brain stimulation (DBS) is a technique used to treat medically-intractable neurological diseases in humans including Essential Tremor and Parkinson's Disease. However, examination of the effects of chronic implantation of DBS electrodes in the brain is limited to a small number of postmortem samples, typically from patients who were implanted for several years.

Methods

In this study, we have utilized techniques in CLARITY tissue clearing and immunohistochemistry to evaluate the neurological immune response presented in post mortem human tissue from patients that underwent DBS treatment for up to 16 years. Tissue along the extent of the electrode track, including cortical, striatal, and subthalamic nucleus targets were assessed for markers of neuroinflammation and neurodegeneration

Results

In cortical tissue, we observe an increase in microglial and macrophage engulfment of lysosomal debris at the along the DBS electrode track, as indicated by the co-localization of IBA1 positive cells and CD68 positive lysosomal vesicles. In addition, hypertrophic astrocytes also demonstrate phagocytic activity, with evidence of association with local neurodegeneration.

Conclusions

We see evidence of greater neuroinflammation near the electrode track in patient with 16 years of DBS implantation. Future directions for this work include assessing tissues for evidence of neuroprotective markers potentiated by long-term deep brain stimulation.

Learning Objectives

To understand the neuroinflammatory response to DBS electrodes.

References